

HORTICULTURAL ABSTRACTS.

VOL. XI

DECEMBER, 1941.

No. 4

Initialled abstracts in the present number are by Mrs. R. M. Ingham of the Imperial Bureau of Plant Breeding and Genetics.

INDEX OF CONTENTS.

| | | |
|--|---------|----------------|
| MISCELLANEOUS | | Nos. 1055-1092 |
| Growth substances | | 1055-1067 |
| Metabolism, environment and nutrition | | 1068-1075 |
| Seed viability | | 1076-1079 |
| Technique | | 1080-1088 |
| General | | 1089-1092 |
| TREE FRUITS, DECIDUOUS | | 1093-1128 |
| General | | 1093-1097 |
| Propagation | | 1098-1102 |
| Rootstocks | | 1103-1104 |
| Pollination | | 1105-1106 |
| Growth and nutrition | | 1107-1112 |
| Manurial and cultural practice | | 1113-1128 |
| SMALL FRUITS, VINES AND NUTS | | 1129-1145 |
| PLANT PROTECTION OF DECIDUOUS FRUITS | | 1146-1204 |
| VEGETABLE GROWING, FIBRES, DRUGS, ETC. | | 1205-1287 |
| FLOWER GROWING | | 1288-1300 |
| CITRUS AND SUB-TROPICALS | | 1301-1350 |
| TROPICAL CROPS | | 1351-1445 |
| STORAGE | | 1446-1462 |
| PROCESSING AND PLANT PRODUCTS | | 1463-1506 |
| NOTES ON BOOKS AND REPORTS | | 1507-1526 |

Horticultural Abstracts

Vol. XI

December, 1941

No. 4

MISCELLANEOUS.

*Growth Substances.**

1055. DOAK, B. W. 577.15.04 : 631.535 : 581.192
Changes in the carbohydrate and nitrogenous constituents of cuttings as affected by hormone treatment. Part I and Part II.

N.Z. J. Sci. Tech., 1941, 22 : 192B-8B, bibl. 8 and 198B-201B, bibl. 8.

Cuttings of *Forsythia* treated with naphthalene acetic acid gradually accumulated more reducing sugars in the lower inch—at the expense of the sucrose present—than untreated cuttings. Large increases occurred in amino-nitrogen and amide-nitrogen following treatment. The chief effect of treatment appeared to be the acceleration of the rate and intensity of a normal change in the metabolism of the cuttings.¹

α -naphthalene acetic acid (1 in 10,000) was more effective in mobilizing nitrogenous materials, except the non-protein nitrogen fraction, at the base of the cuttings than β -indolebutyric acid (1 in 10,000). β -indolebutyric acid exerted more effect on sugars than α -naphthalene acetic acid. The addition of alloxan to the latter increased its effect on sugars. [From author's summaries.]

1056. AVERY, G. S., JR., CREIGHTON, H. B., AND SHALUCHA, B. 577.15.04
Expression of hormone yields in relation to different *Avena* test methods.
Amer. J. Bot., 1941, 28 : 498-506, bibl. 15.

A comparison is made of the "deseeded" and "standard" *Avena* phytohormone test methods in terms of their response to alcohol extracts of maize endosperms and embryos and to certain pure synthetic compounds.

1057. CHADWICK, L. C., AND SWARTLEY, J. C. 577.15.04 : 635.9
Further studies on the effects of synthetic growth substances on cuttings and seeds.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 690-4.

A complete report of the work touched on here and first reported *Ibidem*, 1941, 37 : 1099 (*H.A.* 10 : 798) is promised elsewhere. Commercial preparations such as Rootone, Transplantone and Hormodin were mixed with malic acid to lower the pH to 3. Cuttings of *Juniperus chinensis pfitzeriana* and *Taxus cuspidata* were treated with these acid solutions and with ordinary solutions in the early and late winter. The acid solutions were the more effective in early winter but in late winter were found to be toxic to cuttings. There was definite indication that Canadian talc dust alone had some stimulating effect. A bottom heat of 80° to 85° F. was less successful than one of 70° to 75° F. Results of retreatment were not entirely satisfactory. The addition of vitamin B₁ was significant only when the cuttings had previously been treated with growth substances. It would appear therefore to stimulate, not root initiation, but the growth of the root initials once they have formed. Injuring the cuttings by slicing resulted in heavier root formation. Seed treatment of some 38 flower species resulted in slightly advanced germination in 21 types and slightly retarded germination in 12 types. In only a few cases was increased growth of seedlings following seed treatment recorded. The application of the substances directly in the row had a retarding effect both on germination and on subsequent growth.

1058. MAXON, M. A., PICKETT, B. S., AND RICHEY, H. W. 577.15.04 : 631.535
Effect of Hormodin A, a growth substance, on the rooting of cuttings.
Res. Bull. Ia agric. Exp. Stat. 280, 1940, pp. 931-73, bibl. 29.

Propagators will be grateful for this carefully tabulated account of the degree of success achieved in attempts to induce or accelerate root production in herbaceous, greenwood, evergreen and

* See also 1098, 1126-1128, 1140, 1169, 1208, 1300.

hardwood cuttings of a large number of horticultural species. The cuttings were left in solutions of Hormodin A (i.e. indolebutyric acid dissolved in ethyl alcohol) of several known concentrations for 24 hours, removed, washed in tap water and planted. Whereas with other types considerable success was achieved, with hardwood cuttings results were in general unfavourable. Only a few hardwood cuttings of peach, *Philadelphus coronarius* and a grape variety, Lucile, rooted. Of the peach cuttings treated, whereas no roots were formed on cuttings from which the calluses had been removed from the bases, 23% of the basally treated callused cuttings rooted.

1059. GRACE, N. H. 577.15.04
Effects of talc dusts containing phyto-hormone, nutrient salts and an organic mercurial disinfectant on the rooting of herbaceous cuttings.

Canad. J. Res., 1941, 19, Sec. C, pp. 177-82, bibl. 12.

The plants used were *Coleus blumei*, *Chrysanthemum* vars. and *Iresine* spp. Naphthylbutyric acid treatment increased the number of roots per rooted cutting and combination with nutrient salts increased fresh root weight of *Coleus* cuttings. Organic mercury slightly increased the number of *Chrysanthemum* rooting and increased the number of roots on *Iresine* cuttings. Talc alone increased rooting in most cases. Differential reactions to talc and organic mercury were shown by closely related varieties.

1060. GRACE, N. H., AND FARRAR, J. L. 577.15.04
Vegetative propagation of conifers. IX. Effects of chemical treatments and a wax spray on the outdoor propagation of spruce cuttings.

Canad. J. Res., 1941, 19, Sec. C, pp. 257-66, bibl. 32.

Treatment with 1,000 p. p.m. indolylacetic acid of apparently dormant cuttings of spruce taken shortly before emergence of new growth gave 25% rooting against 8% for the controls and tended to increase root length. Organic mercury, cane sugar and potassium acid phosphate increased survival of new growth and in combination with indolylacetic acid increased survival and root lengths. Talc increased rooting to 70% against 25% for controls in sand but was ineffective in sand-peat mixture. Waxing was ineffective on dormant and injurious to summer cuttings.

1061. STEWART, W. S. 577.15.04
Effectiveness of tryptophane mixtures as growth regulators.

Bot. Gaz., 1941, 102 : 801-5, bibl. 4.

Failure of tryptophane from several sources in lanolin to produce growth curvature in *Avena* coleoptiles was traced to insufficient mixing in preparation. Unless uniform, finely divided dispersion of the substance in lanolin is assured the results may vary greatly, depending on the character of the mixture. This probably applies to other growth substances as well.

1062. KRAUS, E. J. 635.65 : 577.15.04
Histological reactions of bean plants to l-tryptophane.

Bot. Gaz., 1941, 102 : 602-22, bibl. 21.

The paper is one of a series dealing with the histological reactions of plants to various growth-regulating substances. The tissue responses of the bean stem to tryptophane in the development of tumours is shown in some respects to be similar to and in others totally different from the responses to indoleacetic acid or to any of the other compounds so far recorded in detail.

1063. MITCHELL, J. W., AND WHITEHEAD, M. R. 577.15.04
Responses of vegetative parts of plants following application of extract of pollen from *Zea mays*.

Bot. Gaz., 1941, 102 : 770-91, bibl. 23.

ANON.

Growth hormones.

Science, 1941, Vol. 94, No. 2438, Suppl. p. 11.

Application of extract of lanolin from pollen of *Zea mays* in the form of a ring round the stem of bean plants resulted in marked internodal elongation arising from an increase in cell length of the various tissues rather than an increase in the rate of cell division. The effect was most marked with short, sturdy stems and was not seen in plants grown under conditions that favoured etiolation. Histological responses associated with the growth of small tumours that followed

the application of the pollen extract to the cut surface of decapitated second internodes of bean plants were unlike those following the application of relatively concentrated mixtures of indoleacetic or naphthaleneacetic acids and lanolin but more closely resembled those recorded for tryptophane. [From authors' summary.] The material was obtained by extracting ripening maize pollen in ether and evaporating the ether. A fatty substance was left which, mixed with anhydrous lanolin in the ratio of 1 to 4 and spread on the relevant plant part, caused a much stronger reaction than that of the synthetic growth substances hitherto used. It is thought that the effect of the product when isolated and purified may be even greater.

1064. GUSTAFSON, F. G. 635.1/7 : 577.15.04
Probable causes for the difference in facility of producing parthenocarpic fruits in different plants.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 479-81.

Of 4 chemicals used naphthaleneacetic acid proved very effective in inducing parthenocarp in cucumber, pumpkin, squash and tomato. Indolebutyric acid was also successful. Indoleacetic acid was not so good, and 4-fluorene acetic acid gave indication of being unsuccessful.

1065. HITCHCOCK, A. E., AND ZIMMERMAN, P. W. 577.15.04 : 577.16
Further tests with vitamin B₁ on established plants and on cuttings.

Contr. Boyce Thompson Inst., 1941, 12 : 143-55, bibl. 13.

The application of vitamin B₁ did not influence the growth of potted aster plants in June or July or promote root growth in cuttings of 9 genera which had been initially treated with indolebutyric acid. The cuttings of the plants used were capable of meeting their own vitamin B₁ requirements. However, China aster seedlings grown in flats during February and March responded to weekly waterings of a solution of vitamin B₁ by producing taller plants with a greater fresh weight than those watered with tap water only.

1066. MURNEEK, A. E. 577.15.04 : 577.16
Vitamin B₁ vs. organic matter for plant growth.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 715-7.

At concentrations of .025 to 5.0 milligram per gallon of water vitamin B₁ had conspicuously beneficial, though variable, effects on growth of several plants (cosmos, dill, ornamental pepper) in both poor and rich soil, as expressed by dry weight of organic matter produced. Root development was influenced the most. Equally good, and sometimes better results were obtained, however, by merely putting on the surface of the soil a $\frac{1}{2}$ to $\frac{3}{4}$ inch layer of leaf mould which supplied not only sufficient vitamin B₁ but undoubtedly a good many other organic stimulants including many whose importance has not yet been disclosed. But why should plants growing in soil, containing by volume one-third organic matter, be still further benefited by a top layer of leaf mould? Is it possible that this surface dressing plus the relatively high calcium content of the water used encourage azotobacter development? It has been reported that these bacteria, among other functions, synthesize extremely large quantities of vitamin B₁. [From author's conclusions.]

1067. DEFRANCE, J. A. 577.15.04
Seed treatments with phytohormones and talc.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 679-82, bibl. 4.

No advantages noted from treatment of grass seed.

ADDICOTT, F. T.

577.15.04 : 635.656

Effect of root-growth hormones on the meristem of excised pea roots.

Bot. Gaz., 1941, 102 : 576-81, bibl. 7.

BLUM, J. L.

577.15.04

Responses of sunflower stems to growth-promoting substances.

Bot. Gaz., 1941, 102 : 737-48, bibl. 11.

WORLEY, C. L.

577.15.04

Agencies affecting the production of substance B [growth substance] by *Rhizopus suinus*.

Plant Physiol., 1941, 16 : 461-80, bibl. 11.

- DERMEN, H. 577.15.04 : 635.65
Intranuclear polyploidy in bean induced by naphthalene-acetic acid.
J. Hered., 1941, 32 : 133-8, bibl. 9.
- SOYANO, Y. 577.15.04
Physiological and cytological relations between colehiaine and heteroauxin.
 [Japanese.]
Bot. Mag. Tokyo, 1941, 54 : 141-8 [summarized in English, *Jap. J. Bot.*, 1940, 11 : (239)].
- NEWCOMER, E. H. 577.15.04 : 547.944.6
A colehiaine induced tetraploid cosmos.
J. Hered., 1941, 32 : 161-4, bibl. 20.

Metabolism, environment and nutrition.

1068. SUGAWARA, T. 577.16 : 581.192
Studies on the formation of ascorbic acid in plants. 3. Relation between the accumulation of ascorbic acid and the carbohydrate contents in plants.
Jap. J. Bot., 1941, 11 : 147-65, bibl. 50.

Experiments were made on a large number of plants including rice, maize, onion, mint, radish, potato, Jerusalem artichoke, etc. In many a partial parallelism was established between the amount of ascorbic acid and the reducing sugar content in seedlings grown both in light and darkness. An increase in the vitamin was found in seedlings grown on sugar medium, glucose, fructose and mannose giving the highest content followed by sucrose and maltose. Xylose resulted in very low or nil values of ascorbic acid. In the girdled plants an increase was observed. A close correlation was established between the amount of ascorbic acid and the intensity of apparent photosynthesis. It is concluded from the results that ascorbic acid is synthesized from such photosynthetic products as hexose.

1069. WENGER, R. 612.014.44 : 635.939.98
Some effects of supplementary illumination with Mazda lamps on the carbohydrate and the nitrogen metabolism of the aster (*Callistephus chinensis* var. Heart of France).
Plant Physiol., 1941, 16 : 621-8, bibl. 15.

Day lengthening resulted in greater vegetative activity, more flowers per plant and earlier flowering.

1070. BORTHWICK, H. A., PARKER, M. W., AND HEINZE, P. H. 635.655
Influence of localized low temperature on Biloxi soybean during photoperiodic induction.
Bot. Gaz., 1941, 102 : 792-800, bibl. 9.

When the temperature of the terminal buds or of the petiole of Biloxi soybean plants, defoliated to a single leaf, was maintained at 3° C. during a 4-day induction treatment consisting of four 8-hour photoperiods the production of flower primordia was greatly inhibited. Petiole cooling experiments involving plants with 2 leaves indicate that the inhibition of flowering resulted from the influence of low temperature on the transport of a flower-forming stimulus.

1071. EATON, F. M. 581.144.2 : 581.11
Water uptake and root growth as influenced by inequalities in the concentration of the substrate.
Plant Physiol., 1941, 16 : 545-64, bibl. 18.

The investigations were undertaken as a means of appraising the effects of the variability in the concentration of the soil solution often found within the root zone of plants growing on irrigated lands. The test plants were maize and tomato. Grown with their roots divided between 2 or more solutions of unequal concentration they developed more roots in the dilute than in the concentrated solutions and the water uptake from the dilute was the greater. This held good irrespective of whether the differences in concentration were effected by addition to the base

nutrient of chloride, sulphate or additional nutrient salts. Results of other tests are also described.

1072. BOON-LONG, T. S. 581.12
Transpiration as influenced by osmotic concentration and cell permeability.
Amer. J. Bot., 1941, 28 : 333-43, bibl. 10.

The permeability of plant cells to water is shown to have an important effect in increasing the rate of transpiration. Conversely the lowering of permeability by high osmotic concentration reduces transpiration rates.

1073. GOODWIN, R. H. 612.014.44
On the inhibition of the first internode of *Avena* by light.
Amer. J. Bot., 1941, 28 : 325-32, bibl. 27.

WALLACE, R. H., AND BUSHNELL, R. J. 581.084.1
A highly simplified thermionic control of temperature.

Plant Physiol., 1941, 16 : 647-50, bibl. 5.

CLARK, D. G., SHAFER, J., AND CURTIS, O. F. 581.132
Automatic conductivity measurements of CO₂.

Plant Physiol., 1941, 16 : 643-6, bibl. 2.

An outfit is described whereby photosynthesis is automatically measured.

SPRAGUE, V. G., AND WILLIAMS, E. M. 612.014.44

An inexpensive integrating light recorder.

Plant Physiol., 1941, 16 : 629-35, bibl. 3.

HEATH, O. V. S. 581.12

Experimental studies of the relation between carbon assimilation and stomatal movement. I. Apparatus and technique.

Ann. Bot., Lond., 1939, 3 : 469-96, bibl. 35.

HEATH, O. V. S., AND PENMAN, H. L.

II. The use of the resistance porometer in estimating stomatal aperture and diffusive resistance.

Ann. Bot., Lond., 1941, 5 : 455-500, bibl. 17.

1074. SHIVE, J. W. 631.811.9
Significant rôles of trace elements in the nutrition of plants.
Plant Physiol., 1941, 16 : 435-45, bibl. 13.

The fact that many trace elements are essential to plants, though toxic in excess, has already been discovered. Investigation into their different rôles has yet to be made. The author notes how trace element nutrition is apt to involve the action and interaction of pairs of elements such as boron and calcium, iron and manganese. He discusses briefly what is known of the interrelations of these two pairs.

1075. KENT, N. L. 632.3/4 : 546.34
The influence of lithium salts on certain cultivated plants and their parasitic diseases.
Ann. appl. Biol., 1941, 28 : 189-209, bibl. 63.

A study was made of the effect of lithium chloride and nitrate on the susceptibility of celery, wheat and tomato plants to certain parasitic diseases, on growth of the host plants and on the concentration and distribution of lithium in their tissues. The nature of the reduction of susceptibility and of the stimulatory and the toxic effects of lithium is discussed. [From author's summary.]

Seed viability.

1076. MATHER, K., AND NEWELL, J. 581.057 : 581.14
Seed germination and the moon.
J. roy. hort. Soc., 1941, 66 : 358-66.

Five plants, namely radish, cabbage, dwarf bean, carrot, and onion provided the material for this experiment at the John Innes Institution at Merton. In 1940 outside sowings were made

4 times during each lunar cycle, the seeds being placed in the ground 2 days before the dates on which each of the four quarters of the moon fell. All sowings were made in duplicate. Each of the two duplicate samples contained 100 seeds except the bean samples where 20 were used. Special steps were taken to eliminate the possibility of biased results arising from differences in position or soil. The number of days between sowing and the date on which 50% of the seeds had germinated was taken as a measure of the speed of germination. Similarly indoor sowings were made in the same way but with 50 seeds in each case except for beans (20). Results are tabulated, graphed and discussed at some length.

The authors, who do not, however, entirely satisfactorily explain away the coincidence of the April full moon sowings and very superior germination, come to the conclusion that temperature and more especially moisture clearly have profound effects, but that there is no consistent effect of the moon to be observed in either set of observations. They consider that sowing in good conditions of soil and weather will always give good results, while sowing with the moon will convey little or no advantage, at least with the 5 types of plant used in their experiments. An attempt to combine both policies is unlikely to succeed.

1077. BARTON, L. V. 631.531.16

Relation of certain air temperatures and humidities to viability of seeds.

Contr. Boyce Thompson Inst., 1941, 12 : 85-102, bibl. 13.

The amount of water absorbed by seeds of lettuce, onion, tomato, flax, peanut and *Pinus palustris* at 5°, 10°, 20° and 30° C. at relative humidities of 35, 55 and 76% was determined. Differential water absorption was shown according to species. Though there was no direct relation of actual amount of water absorbed to germinability it was found that seeds of high initial viability were much more resistant than those of low initial viability to unfavourable storage humidities and temperatures. Once started, deterioration proceeds rapidly to the death of all the seeds under favourable storage conditions. There was considerable fluctuation in moisture content in seeds stored open in the laboratory, that in August being approximately double that in mid-winter. This probably contributes to the deterioration of seeds in open storage.

1078. KONDÔ, M., AND KASAHARA, Y. 631.531.16

Storage life of seeds. [Japanese.]

Proc. Crop Sci. Soc. Japan, 1940, 12 : 21-4 [summarized in English, *Jap. J. Bot.*, 1941, 11 : (197)].

The rate of germination of bagged seeds kept for 10 years with CaCl_2 in a large box was as follows : *Raphanus sativus* 81.3-89.3%, cucumber 88%, and 58%, *Cucurbita pepo* 54.8%, *Solanum melongena* 36.8%, *Capsicum annuum* 47.3%, *Zea mays* 74.8%, *Avena sativa* 88.5%, rice from Italy poor except one sample 61.5%, rice from Spain 55.5-70.5% except one sample 1.3%.

1079. DARLINGTON, H. T. 631.531.16

The sixty-year period for Dr. Beal's seed viability experiment.

Amer. J. Bot., 1941, 28 : 271-3, bibl. 5.

TAKAGI, I.

634.38-1.531 : 612.014.44

The effect of temperature and light on the germination of mulberry seeds.

[Japanese, English summary.]

Res. Bull. Tokyo imp. seric. Coll., 1940, 2 : 1-26 [summarized in English, *Jap. J. Bot.*, 1941, 11 : (249)].

Technique.

1080. LANGSTROTH, G. O., NEWBOUND, K. B., AND BROWN, W. W. 535.33

A direct reading microphotometer.

Canad. J. Res., 1941, 19, Sec. A, pp. 103-8, bibl. 1.

A direct reading photoelectric microphotometer designed for use in spectrographic analysis is described and illustrated with diagrams.

1081. PIRONE, P. P. 631.535

A new method of plant propagation.

Science, 1941, 94 : 74.

The method is based on the principle that cuttings suspended in the very moist atmosphere of a specially constructed box can develop roots without soil or similar media. The construction of the box is described [a diagram would have made it clearer.—ED.]. A box with glass front and back is divided into two by a piece of sheet rubber stretched across from side to side. In the upper part of the rear chamber thus formed a water trough is fastened and from this strips of absorbent cloth are suspended supplying the moisture necessary to maintain high humidity. Holes are cut in the sheet rubber to take the cuttings, the leafy parts of which remain in the front chamber. Soft wood herbaceous cuttings rooted in 3 weeks and shrubs inserted in January and February in 6 to 8 weeks. Root development was always greater in the neighbourhood of the moisture and poor or lacking in the drier parts of the box.

1082. SWAMIRAO, R., NARASIMHARAO, M. P., AND RAMASWAMI, S. T. 633.842-1.53

Emasculation in chillies (*Capsicum* genus).

Curr. Sci., 1941, 10 : 296.

A rapid method of emasculating *Capsicum* for hybridizing is described. The corolla and stamens are removed *en bloc* and the tedious and often inefficient operation of removing the anthers singly is rendered unnecessary. The method may be found suitable for most other epipetalous flowers.

1083. McDERMOTT, J. J. 581.192

The effect of the method of cutting on the moisture content of samples from tree branches.

Amer. J. Bot., 1941, 28 : 506-8.

It is recommended that when twig segments are to be used for moisture content samples, under conditions such that tensions exist in the wood, both ends of the segment be cut simultaneously. In the experiments which are described samples so cut had significantly higher moisture contents than adjacent samples from the same branch obtained by cutting one end 15-30 seconds later than the other end.

1084. PUCHER, G. W., WAKEMAN, A. J., AND VICKERY, H. B. 581.192

Organic acids in plant tissues. Modifications of analytical methods.

Industr. Engng Chem. (Analytical Edition), 1941, 13 : 244-6, bibl. 10.

Modifications are described of previous methods to determine the total organic acidity, the malic, citric and oxalic content of dried plant tissues. These modifications permit complete analyses to be made on 0.5 gram or even on 0.1 gram of material without sacrifice of accuracy and with greater convenience. [Authors' summary.]

1085. INSTITUTE FOR RESEARCH IN AGRICULTURAL ENGINEERING. 631.3.083/084

The farm tractor.

Oxford, 1941, pp. 30.

Tractor ploughing.

Oxford, 1941, pp. 31.

The booklet on the tractor does not aim at replacing the instruction book issued with a tractor nor at providing a complete guide to tractor maintenance. It sets out rather to give the beginner a first insight into the construction and use of tractors in general and so facilitate his understanding of the special instruction book. In the first section the essential working principles of internal combustion engines are described. In the second the parts of the tractor most likely to concern the operator are considered. Tractor types are also compared, wheels, tracks and capacities considered. Finally hints are given on starting, driving, maintenance and the location of troubles.

How to set about the actual operations of ploughing is profitably dealt with in the second publication. Instructions are given for marking-out, setting-up the ridges, ploughing-out the lands, finishing ploughing the headland and for dealing with irregularly shaped fields, obstructions,

etc. Notes are given on the alternatives to ploughing in lands afforded by round-and-round ploughing and by one-way ploughing. The actual plough and the adjustment of its different parts and special types such as disc ploughs, skims and chains are considered.

1086. BUCKLAND, L. L. R. 531.71/72 : 627.15

Gauging streams and furrows.

E. Afr. agric. J., 1941, 7 : 33-6.

The methods described are by current meter, rod floats, surface floats, notched board and volumetric measurement.

1087. BERGERET, G. 674.048.4

Impregnación de maderas. (**Wood preservatives.**) [English summary.]

Reprinted from *Rev. As. Ing. agron. Uruguay*, No. 1, 1941, pp. 6, bibl. 5.

Various methods of preserving wood from decay, particularly that used for telegraph poles and railway sleepers but also wood used in buildings, are described. Sections are also devoted to methods of rendering wood fire- and damp-proof.

1088. ANON. 631.544 : 666.16

Repairing small holes in glass.

War-time Notes Cheshunt exp. Res. Stat. 1, 1941?, pp. 1.

Attention is drawn to the fact that repairs to glass can be made by the use of a proprietary substance called the Bostik B. Glazing Compound made by the B.B. Chemical Co. Ltd., Ulverscroft Works, Leicester.

General.

1089. GULICK, A. 576.312.32

The chemistry of the chromosomes.

Bot. Rev., 1941, 7 : 433-57, bibl. 130.

A review of our present state of knowledge on the chemistry of the chromosomes.

1090. WAINIO, W. W., AND FORBES, E. B. 634.1/7 : 581.192

The chemical composition of forest fruits and nuts from Pennsylvania.

J. agric. Res., 1941, 62 : 627-35, bibl. 7.

This survey has been made as a preliminary to measures calculated to conserve the wild life of the forests in Pennsylvania. Determinations were made and are here recorded of moisture, total nitrogen, ether extract, crude fibre, ash, nitrogen-free extract, tannin, lignin, cellulose, available nitrogen, calcium, magnesium and phosphorus of the fruits of 25 forest species such as crab apple, blueberry, elder, junberry, sumac, etc., and of 8 types of nut-bearing trees including 4 kinds of oak, black walnut and chestnut (*Castanea vulgaris*). The figures are discussed.

1091. TUKEY, H. B. 631.411.4 + 631.878

Peat—its nature and value to horticulture.

Rur. N. Yorker, 1941, 100 : 392.

The origin and composition of various types of peat are described. Peat moss is 98% organic matter, pH 3.0-4.5, low in nitrogen, 1%, and ash, 1.5-3.0%. It will absorb 6-15 times its dry weight of water. The finer kinds are useful in horticulture. Sedge and reed peat is 80-95% organic matter, pH 4.5-6, nitrogen 2.0-3.5%, and ash 5-30%. It will absorb 3-12 times its dry weight of water and is valuable for composting and as a surface mulch. Forest peat is 75-90% organic matter, pH 3.0-4.5. It will absorb 4-8 times its weight of water and is valuable for soil improvement. Peat soil or sedimentary peat is 60-80% organic matter, moderately acid or even alkaline, pH 4.5-8.0, and may absorb only a few times its weight in water. It is valuable for soil improvement. The author considers that peat moss used on garden soils and in seed beds often gives a better return than a similar amount spent on fertilizers.

1092. KUZMIN, V. I., AND SKVORTZOW, B. W. 635.967.2

Bog and water plants of Manchuria. I. The genus *Potamogeton*.

Philipp. J. Sci., 1941, 74 : 395-409, 14 plates.

- DUNN, E. E., AND WHEETING, L. C. 631.86
Utilization of barnyard manure for Washington soils.
Bull. Wash. agric. Exp. Stat. 395, 1941, pp. 20, bibl. 16.
- ROSENE, H. F. 635.25 : 581.144.2 : 581.11
Water balance in the onion root : relation of volume intake to volume exudate of excised roots and isolated root segments.
Plant Physiol., 1941, 16 : 447-60, bibl. 19.
- EATON, S. V. 633.854.54-1.811.7
Influence of sulphur deficiency on metabolism of the sunflower.
Bot. Gaz., 1941, 102 : 536-55, bibl. 37.
- COMAR, C. L., AND ZSCHEILE, F. P. 535.33
Spectroscopic analysis of plant extracts for chlorophylls a and b.
Plant Physiol., 1941, 16 : 651-3.
- BENNE, E. J. 581.192 : 577.16+547.979.7
Report on chlorophyll and carotene in plant tissue.
J. Ass. off. agric. Chem., Wash., 1941, 24 : 526-39, bibl. 20.
- STEWART, F. C., AND PRESTON, C. 633.491 : 581.13
Effects of pH and the components of bicarbonate and phosphate buffered solutions on the metabolism of potato discs and their ability to absorb ions.
Plant Physiol., 1941, 16 : 481-519, bibl. 27.
- BRIESE, R. R., AND COUCH, J. F. 581.088
Mercuric chloride as a preservative of cyanogenetic plants for chemical analysis.
J. agric. Res., 1941, 62 : 493-507, bibl. 4.
- COWLING, H. 546.47 : 581.192
Report on zinc in plants.
J. Ass. off. agric. Chem., Wash., 1941, 24 : 520-5.
- McHARGUE, J. S., AND HODGKISS, W. S. 546.27 : 581.192
Report on iodine and boron.
J. Ass. off. agric. Chem., Wash., 1941, 24 : 518-20, bibl. 1.
Determination of boron only in plant material.
- BATEN, W. D. 519 : 633
How to determine which of two variables is better for predicting a third variable.
J. amer. Soc. Agron., 1941, 33 : 695-9, bibl. 1.
Experimental material wheat heads and bean leaflets.
- CRIST, J. W. 519 : 581.084
Correlation from ranks, for horticultural research.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 593-5, bibl. 1.
- BATEN, W. D., NORTHAM, J. I., AND YEAGER, A. F. 519 : 635.64
Grouping of strains or varieties by use of a latin square.
J. amer. Soc. Agron., 1941, 33 : 616-22, bibl. 7.
Tomatoes were the experimental material.

TREE FRUITS, DECIDUOUS.

General.

1093. LAL SINGH, AND BAL SINGH. 634.1/8
The Kashmir fruit industry.

Publication Punjab Fruit Development Board, Lyallpur, 1939, pp. 8, 2 annas.

A brief description, based on a visit, of fruitgrowing in the Kashmir valley, altitude 5,000 to 6,000 ft. In 1938 there were in it some 18,300 acres devoted to deciduous fruits, 8,000 of these being under apples, 5,000 under walnuts, 1,375 under almonds, 1,250 under apricots, 1,200 under pears. A large area is devoted to nursery production and salient features of some of

these nurseries are discussed. Most of the fruit is exported to other centres in India. Compulsory spraying has led to the efficient control of the San José scale (*Aspidiotus perniciosus*).

1094. LAL SINGH. 634.1/8
Fruit industries. Part I—of Egypt. Part II—of Palestine. Part III—of Italy and Sicily. Part IV—of France and Switzerland.
Publications Punjab Fruit Development Board, Lyallpur, 1935, pp. 1-26, 27-52, 53-72 and 73-94, 8 annas per part or Rs. 1-12-0 for the four parts.

The author modestly refers to these publications as a collection of brief notes made while on tour in the countries named from April to October, 1934, and they should be regarded as such. He does not pretend to have seen everything of horticultural importance in each country visited. Thus in Switzerland he visited Lausanne but apparently not Wädenswil. In Italy he did not visit Portici, Conegliano and other important centres, but he did travel extensively and being of keen observation gathered a deal of interesting information both regarding cultivation and marketing. This is all set down here and when the piping days of peace return and horticulturists again come into their own and go a-visiting, they could not do better than study Mr. Singh's rough maps and account of places visited before drawing up their own itinerary.

1095. DIBROVA, P. A. 634.11-2.111-1.521.6(47)
New varieties of apple of the North Urals. [In Russian.]
Publication of Michurin's Sverdlovsk Fruit Exp. Stat. 1940, pp. 14, also Plodovo-Jagodnye Kultury (Fruit Crops) 1940, No. 4.

The importance of the local forms is once more stressed. Many forms of apple capable of growing in the Urals have been raised by amateurs by simply sowing the seeds and carefully tending the seedlings in the early stages. A study of these local forms has been made and the best are being propagated; they are described and illustrated in this bulletin, characters of the tree, fruit and flesh being given, together with data on time of ripening, winter-hardiness, resistance to drought, scab and other diseases. The best forms have survived winters where the temperatures have gone down to as low as -50°C . The high quality of some of these varieties fully justifies the method and they are to be crossed with the best varieties of Western Europe in the attempt to raise their quality still further.

1096. MUSGRAVE, C. T. 634.11 : 641.5
What are the best apples for cooking ?
J. roy. hort. Soc., 1941, 66 : 332-4.

Cooked apples should be just as pleasantly acid in March as they are in September. It is a question of growing the right varieties. The succession recommended here for England is—1. August and September, Keswick Codlin or Early Victoria. 2. October and November, Golden Noble, Warner's King, Allington Pippin. 3. December to March, Bramley's Seedling, King Edward VII.

1097. ZIMMERMAN, G. A. 634.418
Hybrids of the American papaw.
J. Hered., 1941, 32 : 83-91.

The American papaw (*Asimina triloba*) grows over the entire eastern United States except New England and Florida. Itself a temperate zone plant it is related to the tropical *Annona* family. There is great variation in the fruit, which can be roughly classed into two types, namely a large yellow-fleshed, highly flavoured, early-ripening type and a white-fleshed, mild-flavoured late- or very late-ripening type. The size varies greatly. The fruit will not stand cold and a cold wind for a few days with a temperature below 50°F . will turn it black and spoil its flavour. The Martin variety though small and of not very good flavour is more cold-resistant than others. To set fruit hand pollination is necessary in the varieties at present known. Papaws can be propagated by seed or by grafting on any native stock. The author has done much work on hybridizing and selecting *A. triloba* and has crossed it with *A. obovata*, *A. angustifolia*, *A. incana*, and *A. reticulata*, and also with *Annona* pollen.

Propagation.

1098. RAPPAPORT, J. 577.15.04 : 581.163
Possibilities of growth promoting substances in fruit growing.
Int. Rev. Agric., 1941, 32 : 44T, 50T, bibl. 23.

A review of the literature on the use of growth-promoting substances for the production of parthenocarpic fruit and of their influence on the ripening processes of fruits, on grafting and on root formation in cuttings. R.M.I.

1099. OFFICERS OF THE FRUIT BRANCH, QD. 634.1/7-1.534/541.5
Propagation of fruit trees.
Qd agric J., 1941, 54 : 453-71.

The propagation of fruit trees by budding and grafting of different types, by cuttings and by layering is described with the aid of clear illustration.

1100. TAMAI, T. 631.535 : 631.67
Two types of auto-irrigated nursery. [Japanese, English summary 1½ pp.]
Bull. Taihoku Sch. Agric. 2, 1941, pp. 120-35, bibl. 20.

With the help of 2 clear plates and other illustrations the author describes the working of two types of self-irrigated propagating frames for the propagation of cuttings. The first type he calls the "porous cell" type. In principle it is said to resemble that of Livingston (*Plant World*, 1918, 21 : 202), but instead of a porous clay cup enlarged flat cells are used. The moisture content of the soil can be regulated and heating can be supplied either electrically or by placing manure under the self-irrigating cells. The second he calls the "porous block" type. In this the water supplying surface is made of porous but not hollow blocks such as bricks and porous clay plates. The principle is similar to that described by Redington (*New Phytol.*, 1928, 27 : 220-7) but porous bricks take the place of flannel lining. The temperature is not regulated. The author notes that the moisture distribution in both his types is similar, since each portion of soil on the same level is the same distance from the water supplying surface.

1101. SINGH, R. S. 634.11-1.541
Propagation of the apple in Kumaun.
Indian Fmg., 1941, 2 : 242-50.

The article deals at length and with clear illustrations of stooling, layering, budding and grafting with the propagation of the apple. The rootstocks most useful in Kumaun so far have proved to be Crab C, Malling XIII, II, Merton 779 and 793 and a local selection known as Chaubattia I. The last three have been found highly resistant to woolly aphid. A local belief which has been found incorrect is that in budding the wood should be removed completely from the back of the shield in May but not in September. What was found was that by any method September buddings gave the greater success. No difference has been found in subsequent performance between grafted and budded trees.

1102. BEAKBANE, A. B., THOMPSON, E. C., AND TYDEMAN, H. M. 634.11-1.541.11 : 581.144.2.632.753
Preliminary selection of apple rootstocks immune from woolly aphid based on certain anatomical differences in root structure.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 32-6, bibl. 11.

As the work of breeding apple rootstocks immune to woolly aphid proceeded it became clear that the testing on a field scale of the rootstock potentialities of all the crosses available would require much more land than was available. In a previous article [*J. Pomol.*, 1939, 17 : 141-9, *H.A.*, 9 : 784] it was shown that the proportion of bark to wood in the roots of apple is correlated with potential vigour in a number of rootstocks. Using this correlation the authors have now divided the crosses available into 7 groups on the basis of percentage of bark in the root. As a result 55 individuals, all of which have shown promise of ready rooting and health in propagation tests, have been selected for trial under field conditions.

Rootstocks.

1103. SHABLOVSKI, B. I.

634.11-1.541.11

Root grafting hybrids on mentors.*Vernalisation*, 1940, No. 4 (31), pp. 87-94.

Michurin sought to influence hybrid plants while they were still in the early process of formation. Although, as a consequence, many of them possessed valuable qualities, they also suffered from defects, which only became obvious in the final stages of formation. In practice the need for the removal of these defects became evident after three to five years of fruit bearing. Improvement could only be effected by repeating the cycle of development from seed, thus influencing the hybrid at the earliest possible stage. The more fundamental the change of inheritance called for, the earlier was it necessary to influence the hybrid. Michurin was the first to point out that suckers springing from below the root collar, which belonged to a seedling hybrid growing on its own roots, more closely resembled in their development a seedling growth than did suckers from a tree of an old variety also growing on its own roots. Bearing in mind the foregoing considerations, the following procedure was adopted: A hybrid plant already bearing fruit, raised from seed and growing on its own roots, which needs to be improved in certain respects, is selected for experiment. Small roots are cut from it and grafted into the crowns of old-established varieties which too must be growing on their own roots and which are intended to transmit the desired characters to the shoots which will grow on the grafted roots. After one or two years, when the grafted roots have had time to establish a union with the mentor, forming the tissue necessary for the purpose from nutrient substances supplied by the latter, buds are formed on the grafted roots and develop into shoots. The grafted roots soon replace the nutrients which they accumulated when growing on the original hybrid by those elaborated by the mentor. The buds and shoots which spring from them develop wholly under the influence of the mentor which thus exercises such influence at the earliest possible stage of development of the shoot. In view of the fact that the work outlined above was to be undertaken for the first time, it was sought to achieve the following objects: To apply a method of grafting which would ensure the fullest possible influence of the mentor on the root of the hybrid and shoots developed from it; to ensure the normal union of the grafted roots of the hybrid with the mentor and their further growth; to obviate the drying up of the grafted roots; to strengthen their resistance to low temperatures, enabling them to withstand winter conditions; to ensure the formation of buds on them, and from the inception of the shoots, their development as much as possible by means of the nutrients of the mentor. The experiments described here, chiefly with apple trees, began in 1938 at the Ukrainian Scientific Institute of Fruit Culture, and continued in 1939 and 1940. In February and March, 1938, small roots, each of 0.5 to 1.5 cm. thick and 12 to 15 cm. long, were cut from specimens of hybrids and grafted on the selected varieties of mentors, each of the latter being notable for a particular quality such as early ripening, early fruit bearing, or winter hardiness. In all 108 grafts were made of two pieces of root on each mentor. When later the plants were taken from the cellar it was seen that intensification of the flow of sap had set in, quickening the formation of callus and facilitating the union of the grafted components. They were then returned to the cellar, where they remained until spring. When growth began they were transplanted into soil. It should be mentioned that the roots for grafting were collected in autumn at a time when their store of nutrients was greatest and when the leaves had fallen. The best results were obtained by bridge grafting, one end of the root being united with the stem and the other with its branch. Other methods proved unsatisfactory. After grafting, the roots were wrapped in moist gauze the end of which, after transplanting had taken place in spring, was dipped in the form of a wick into a flask containing water, thus ensuring continuous moisture and preventing the root from drying up. As the first stage of growth neared its end in mid and late June, the grafted parts had united to such an extent as to permit of the loosening of the ties and the gradual cutting away of the branch on which the root was grafted. In order to divert the ascending and descending flow of sap along the branches to the root this pruning was done below the ties. After the diversion had been accomplished (in the middle of July) the moistening of the root was gradually discontinued. When the grafts had firmly united and the sap was flowing normally, there was no longer any danger of the root drying up and cracks soon appeared on

its surface ; bark like that of branches was forming. Out of 68 bridge grafts 66 resulted in firm unions. Observations had shown that the roots of trees growing on the edges of steep banks and exposed by the crumbling of earth at the beginning of the growing period became hardened to cold. Consequently, the opinion was formed that if roots were grafted in the early spring their resistance to low temperatures would be much strengthened. This opinion was fully borne out by experiments undertaken in 1939-40 when the winter in Russia was exceptionally severe ; roots grafted to branches by the bridge method, which otherwise would have been most susceptible to cold, withstood frosts so acute that even the stocks of wild species of fruit trees, strongly resistant to cold, nevertheless perished. One remarkable fact should be mentioned : on examination in spring when the trees were still leafless it was found that the roots had changed colour. These changes were regular : the roots of each variety of hybrid acquired the colour-tone of that variety of mentor to which it had been grafted. The most potent agents in effecting these changes were Siberian and wild apple trees, thus confirming Michurin's opinion regarding the superior virility of wild plants in the transmission of characters. It has been said that the longer the root is subjected to the influence of the mentor before forming shoots, the more considerable will be the mentor's influence on the grafted hybrid. Hence, during the first year growth on the root should not be hastened ; compelling the hybrid to build itself on the nutrient of the mentor would facilitate the desired changes. Several methods, involving defoliation, were tried but proved unsatisfactory. The conclusion was reached that transpiration was interrupted by the removal of the foliage from the shoot and that, as a further consequence, the flow of sap was slowed down. A method was then devised for retaining the leaves while depriving them of assimilative capacity. In the earliest stages of their development the shoots were placed in little black bags with small apertures for ventilation, and these in turn were covered over with white bags in order to prevent overheating from the sun rays. After 40-60 days, during which the shoots depended wholly on the nutrient of the mentor, the number of ventilating apertures was increased and then gradually, when the fourth and third leaves from the top fell, the black bags were replaced by white gauze bags ; henceforth the shoots developed normally in the light, manufacturing their own nutrients.

1104. YAKOVLEFF, P. N.

634.2-1.541.11 : 581.175.11

The influence of the mentor on the transmission of pigments. [Russian.]*Vernalisation*, 1940, No. 1, (28), pp. 11-3.

The trials reported here show that, contrary to the generally accepted views of physiologists and geneticists, pigmenting substances are transmitted from mentor to graft. During the spring of 1939 a slip from a one-year-old hybrid was grafted on to the crown of the red-leaved plum Cistana (*Cerasus besseyi* × *Prunus pissardii*). The hybrid was the result of crossing the American plum Okiya with the peach Amsden. The American plum Okiya itself represents the end-product of a series of complicated hybridization processes, consisting genetically of three different genera: *Prunus*, *Cerasus*, *Persica* and—from the systematic point of view—of four widely separated elements: *Cerasus besseyi*, *Prunus munsoniana*, *Prunus salicina* and *Persica vulgaris*. This complex hybrid proved to be of great plasticity, i.e. easily yielding to the influence of new factors especially those of the mentor. A root of the hybrid was grafted upon the red-leaved Cistana and soon showed marked signs of growth. Two short shoots appeared and on the 25th of May had attained a length of 10 cm. On this date all the leaves were removed, with the exception of the 3 uppermost. Each time a new leaf appeared at the tip the oldest was removed. Only three leaves remained thus on the hybrid during the period between the 25th of May, 1939, and the end of the growing period of that year. As a control a slip from the same hybrid, Okiya × Amsden, was grafted on to the crown of the green-leaved plum Orata. The two grafting operations were carried out at exactly the same time and the removal of the leaves was effected in both cases by identical methods. The two slips from the hybrid Okiya × Amsden were thus placed in identical positions to undergo any influences that might be exercised by the red- and green-leaved plum trees respectively. On the 1st of September the hybrid grafted upon the red-leaved plum had attained a length of 28 cm., that on the green-leaved plant a length of 29.25 cm. The leaves of the hybrid grafted upon the green-leaved plum did not alter in colour, but in shape they were somewhat broader and smaller than usual. The leaves of the hybrid, grafted upon the red-leaved plum, however, were very much darker in colour than they

had originally been and now differed only very little in colour from those of the mentor. The acquired coloration remained dark red, astonishingly similar to the red-leaves of the mentor. The form of the leaves was almost unaltered. The change of colour in these leaves proceeded very rapidly and on June 5th they already differed markedly from those of the control. At the end of July their colour was already decidedly red and at the end of August dark red. To investigate how far the red-leaf-character is inherent in the hybrid, the latter will be self-pollinated and the seeds thus obtained will be sown.

Pollination.

1105. CRANE, M. B. 634.1/2 : 581.162.3
The production of fruit.
J. roy. hort. Soc., 1941, 66 : 350-7.

Lists are included of varieties of different fruits, cherries, plums, apples and pears classified in various ways, i.e. time of flowering, inter- and self-compatibility, etc. A consideration of known facts on these points allows the grower to decide on the desirability or undesirability of planting particular varieties together.

1106. BOTEZ, I. 634.13 : 581.162.3
 Felul de a se comporta în procesul de fecundare a câtorva varietăți de păr.
(The behaviour of certain pear varieties in the process of fertilization.)
Anal. Inst. Cerc. Agron. Român, 1938 (1939), 10 : 395-415.

Only 2 self-fertile varieties of pear, Beurré Bosc and Beurré Gens, were found. The various kinds of sterility encountered are described and the behaviour of each of the varieties studied is discussed. By their seed production and behaviour as pollen or maternal parents the varieties Curé, Beurré Diel, Beurré Liegel and Duchesse d'Angoulême are presumed to be triploid. All other varieties examined were diploid. In certain crosses the fruit weight of the hybrids was higher than the average of the two parents.

Growth and nutrition.

1107. OSTERWALDER, A. 634.1/7 : 581.145.1
 Wachstum und Reife der Obstfrüchte und Trauben in ihrer Abhängigkeit vom Klima. **(Growth and ripening of fruit and grapes as related to climate.)**
Schweiz. Z. Obst- u. Weinbau, 1941, 50 : 1-7.

The correlation of warmth and fruit development is being studied in Switzerland and Germany. In a recent article in *Forschungsdienst* (see H.A., 11 : 393) an account is given of a 5-year study of the number of hours of effective heat which elapsed each year between 1 January and the average blossoming date of 18 pear varieties. In the present article the author tabulates one year's observations on the amount of heat experienced between the blossoming and ripening of some 17 apple, 6 pear, 6 cherry, 4 vine and a number of other fruit species in Switzerland in 1940. The reader can see from the figures not only that such an apple bloomed on such a date and reached a particular stage of ripeness on such a date but in addition under what climatic conditions this ripeness was achieved. For example take the apple variety, Klarapfel. Here the sum of all the mean day temperatures in the 91 days between blossoming and ripeness was 1386° C., the number of hours of sunshine 654 and the amount of rain 425 mm. (or 425 litres per square metre) or, expressed in another way, Klarapfel needed between blossoming and ripe fruit production a daily mean temperature of 15.2° C., 7.2 hours of sunshine and 4.6 mm. rain. The period between blossoming and fruit maturity in apples varied from 146 to 176 days or from 2,198° C. to 2,479° C. of heat, in pears from 139 to 181 days or 2,099° C. to 2,529° C., in cherries the heat necessary varied from 600° C. to about 1,200° C., in zwetschgen from 1,267° C. to 2,225° C. Of the small fruits raspberries only needed 33 days with a heat total of 527° C., next came blackberries 52 days and 855° C., red currants 65 days and 918° C. and gooseberries 81 days and 1,181° C. The 4 vines tested—which of course flower later—needed amounts of heat varying from 1,525° C. to 1,614° C. A comparison of these figures with similar figures in other years and with figures for the same varieties under other conditions of climate and soil would be extremely interesting.

1108. GAYNER, F. C. H. 631.432 : 634.13

Studies in the non-setting of pears. IV. The effect of irrigation and injection on the June drop of Conference pears.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 36-41, bibl. 10.

Work by Rogers and Srivastava [*Ibidem* for 1936, pp. 110-3, *H.A.*, 7 : 580] had indicated the possibility of the June drop of pears being due to water shortage. In the trials described here the author found that the fruit drop from sample branches on 4 irrigated and 4 control trees of Conference on quince A, about 20 years old, during the June drop periods in 1939 and 1940 at East Malling was similar and hence did not confirm the indication mentioned. In 1940 irrigations were continued up to the time of picking but the increase of size in fruit was below the level of significance. The natural storage life of the irrigated fruit was shorter than that of the controls.

1109. GAYNER, F. C. H. 634.13 : 581.145.1

Studies in the non-setting of pears. V. The size of flower in relation to its position in the truss.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 41-3, bibl. 3.

The diameter of the corolla and fresh and dry weights of Conference flowers from forty trusses (some from a tree on quince C, the others from one on quince G) were taken in 1939 and 1940. The flower in the second position (the terminal flower occupying the first) was the smallest and lightest flower and there was a gradual increase in the size and weight of the flowers with positions lower down the inflorescence. The largest and heaviest flowers were found in positions in which the highest percentage set is known to occur, with the exception of the terminal or King flower which in spite of its large size has a low percentage set. [Author's summary.]

1110. GAYNER, F. C. H. 634.13-1.55-1.8

Studies in the non-setting of pears. VI. The injection of pear trees for the diagnosis of carbohydrate and mineral deficiencies.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 50-5, bibl. 11.

Solutions of compounds of N, P, K, Mg, Ca, Zn, Fe, Mn, Cu, B, Ni and Co were introduced by leaf injection into the free cropping pear, Conference, and the shy bearer, Doyenné du Comice. Comice gave positive responses to N, P, Mg, Zn, Fe and B, while Conference reacted to N alone and that only slightly. Spectrographic analysis by the oxy-hydrogen and oxy-acetylene flame methods of leaves from the strong crop-bearing side of a Comice tree suggested that the mineral nutrition on this side was better than on the other side where neither vigour nor crop were seen. The results would appear to indicate that defective mineral nutrition may be one cause of shy cropping.

1111. SCHNEIDER, G. W., AND CHILDERS, N. F. 634.11-1.432 : 581.132

Influence of soil moisture on photosynthesis, respiration and transpiration of apple leaves.

Plant Physiol., 1941, 16 : 565-83, bibl. 22.

1. Determinations of apparent photosynthesis, transpiration and, in some cases, respiration were made on small apple trees (Stayman and McIntosh) while the soil in which they were growing gradually dried to the wilting percentage, after which it was watered to field capacity. The reference trees were watered at regular intervals. Experiments were performed both in the field and in a large insulated chamber where light was held constant at an average of about 4,000 foot candles for all leaves concerned, humidity at about 30 per cent., and temperature at levels of 80°, 90° or 100° F. 2. The data show that an increase in apparent photosynthesis was associated with a slight decrease in soil moisture below the field capacity of the dark, fairly heavy soil employed in these experiments. Under temperature conditions of 100° F. this period of increase in photosynthesis was shorter (1 to 2 days) than when the temperature was 80° F. (2 to 4 days). 3. At a temperature of 80° F. the first reduction in apparent photosynthesis occurred the fifth day after the last watering; at temperatures of 90° and 100° F. the first reduction in assimilation occurred on the third day. Ordinarily, under conditions of a gradually drying soil, there was a reduction in the rate of transpiration for at least one day before there was a reduction in photosynthesis. If evaporation conditions were low, this reduction in transpiration sometimes extended over a longer period of time before photosynthesis showed a

definite decrease. 4. Before wilting was evident, there were marked reductions in apparent photosynthesis and transpiration, and an increase in respiration. . . . 5. On several occasions fairly high rates of photosynthesis were obtained when the stomata appeared to be closed. 6. When the plants showed definite wilting, and the soil moisture was approximately at the wilting percentage, there was an 87 per cent. reduction in both photosynthesis and transpiration. . . . 7. When water was applied to the soil in which wilted apple trees were growing, the leaves usually attained turgidity within three to five hours, depending upon their degree of wilting. They did not, however, recover to their original relationship with the controls in photosynthesis and respiration before two to seven days after the watering. Transpiration usually recovered about the same time as photosynthesis or slightly earlier. 8. The general trend of photosynthesis for the test plants was approximately the same in the field as in the environment-control chamber. [From authors' summary.]

1112. DE VILLIERS, G. D. B.

631.543.1 : 634.1/8

A micro-climatic study : shade and its modification of the physical environment.

Sci. Bull. Dep. Agric. S. Afr. 215 (*Stellenbosch Scientific Series* 42), 1940, pp. 53, bibl. 8, 1s.

The author, making full use of experimental data already published by Black, Micklem, Reinecke and others sums up his own observations in S. Africa as follows :—1. The broad outline of the problem of delayed foliation was indicated and the more important major aspects stressed. 2. In this micro-climatic study, the environmental factors considered were : radiation, air temperatures, evaporation, light intensity, soil temperature and soil moisture. Particular attention was given to the modification of the environment by shade during the winter months. 3. The major influence of shade on radiation temperatures is to ameliorate excessively high temperatures. This is especially true for the months June and July, where a fall in the mean weekly temperature of over 10° F. for the interval 12 p.m. to 4 p.m. from the exposed to the shaded positions has been observed. 4. The mean weekly minima radiation temperatures for the interval 4 a.m. to 8 a.m. are on the whole lowest in the exposed positions and rise progressively in the direction of the shelter, unless influenced by other factors. In June this difference in mean weekly temperature from the exposed to the sheltered position has been observed to amount to approximately 3°. 5. Maxima air temperatures are largely influenced by shade and this influence is especially pronounced in warm winter weather. Differences of 5° have been observed in the mean weekly maxima temperatures for the sheltered and exposed positions. Minima temperatures are affected to a lesser degree. 6. A decrease of 0.46 square inches in the evaporation index has been observed in some cases. 7. While for May, June and July the shaded positions had light intensities ranging from 30 to 40 lux, the intensities in the exposed positions varied from approximately 400 to 500 lux between 11 a.m. and 2.30 p.m., i.e. shade decreased the light intensity by approximately 90 per cent. 8. A decrease of 3° to 4° in the mean monthly temperature of the soil at a depth of one foot was observed. 9. An increase in soil moisture as percentage of dry weight by 2 per cent. was obtained. 10. The effect of an artificial shade in the nature of a reed shelter on the N.W. side of a tree upon the physical environment was also investigated. Similar results to the above-mentioned were obtained in the case of radiation air temperatures and evaporation indices. 11. The opinion is expressed that radiation may be used as a fundamental criterion for the study of delayed foliation. [Author's summary.]

Manurial and cultural practice.

1113. WALLACE, T.

634.1/8-1.8

Manuring fruit crops in war time.

Growmore Bull. Minist. Agric. Lond. 4, 1941, pp. 11, 3d.

In this practical bulletin will be found suggestions for overcoming the present war-caused shortage of mineral fertilizers, notably of those rich in potash and phosphate. The symptoms of nutrient deficiencies are first considered and next the author proceeds to discuss how soil fertility can be best maintained in the orchard under war conditions. He discusses in turn :—*Maintenance of soil organic matter. The potash problem.* Among materials likely now to be

available are some of the chloride-containing materials such as kainit, the application of which in the winter months is likely to be beneficial except for red currants. Neither common salt nor lime are advocated. Stable manures will supply only part of the potash necessary. Composts made from leafy crops may supply fair amounts. Seaweed will supply potash [see *Advisory Leaflet* 200]. Wood ash is a good source of potash, likewise bracken, especially young bracken, composted or burnt. Of flue dusts cement flue dust contains few harmful substances but less potash than blast furnace flue dust. Before using the latter analysis is advisable. As regards precedence for potash the following order of potash requirements is suggested:—high potash requirements, apples, gooseberries, raspberries, red currants; medium requirements loganberries and blackberries; lower requirements plums—with certain exceptions—pears, cherries, black currants, strawberries. *The merits of phosphates.* It is suggested that 2 to 3 cwt. of superphosphate annually per acre should suffice for bush fruits and occasional dressings of 3 to 5 cwt. for top fruits. All phosphatic manures except the particularly slow acting ones such as rock phosphates are suitable. *Need for magnesium.* *Use of lime.* *Use of various fertilizers.* *Manuring in relation to pests, diseases and spraying.* *Manuring in relation to yields and quality.* The above are dealt with rather more briefly. Finally the special manurial requirements of individual fruit crops are considered in turn.

1114. MEIER, K. 634.1/2-1.8
 Düngung der Obstbäume. (*Manuring of fruit trees.*)
Schweiz. Z. Obst-u. Weinb., 1941, 50 : 111-25.
 BRYNER, W.
 Ueber die Technik des Düngens der Obstbäume. (*The technique of fruit tree manuring.*)
Schweiz. Z. Obst-u. Weinb., 1941, 50 : 125-8.

In the first article, which formed part of the proceedings of a joint meeting of the Lausanne and Wädenswil Research Stations at Wädenswil in February 1941, the whole problem of fruit tree manuring is considered in some detail by the Director of Wädenswil and an attempt is made to lay down the exact requirements of the chief tree fruits and how these can best be fulfilled. In Swiss gardens and in clean cultivated orchards farmyard manure and fertilizers are ploughed or dug in. In grass orchards either fertilizers are broadcast or a better practice consists in lifting the grass sods with a three-pronged tool, inserting the fertilizers and replacing the sod. The insertions are made at intervals of about 70 cm. from each other and in circles round the tree starting at about 1 to 1.5 m. from the trunk and reaching out to about 1 m. beyond the area covered by the branches. A third system, the operation of which is illustrated, is the application of fertilizers by means of the fertilizer lance of which there are said to be several models [see previous abstracts, *H.A.* 3 : 301, 4 : 189, 587 ; 9 : 67]. The lance can be driven by a motor sprayer and in it can be used liquid manure or fertilizer in solution.

In experiments with the lance it has been found possible to use highly concentrated solutions, 2-10%, without damage to the tree. The author gives an example of the amount of fertilizer which would normally be given in this way to an apple tree of 75 cm. diameter growing in soil with a normally good P_2O_5 and K_2O content and adequately supplied with lime. Figures (here tabulated) of nutrients removed from the soil by an apple tree of this size and considerations of leaching, etc., show that the necessary amounts of fertilizer will be 1804 g. sulphate of ammonia, 602 g. superphosphate (18%), 1,618 g. potash salts (30%). These will, then, be dissolved in about 300 l. of water and the solution will be strained. Some 90 injections will be necessary, i.e. at just over a litre a time and they will be made in three circles round the tree at a distance of 2, 3 and 4 m. from the tree with about 70 cm. between each injection hole. Given a pressure of 10 kg. $cm.^2$ and using 2 lances the operation should take about 30 minutes. To save fuel it is suggested that short, fairly wide hose should be used.

The second article is mainly concerned with the technique of the fertilizer lance method and in it details are given of the achievement, which varies according to pressure, calibre of hose, number of lances, etc. The author warns growers not to use boron salts in solution as it is found that they are very apt to crystallize out and wear out the pump cylinders. He considers that the use of the fertilizer lance is greatly superior to older methods, especially in the quick results achieved.

1115. ANON. 634.75-1.8 : 664.85.25.036.5

Canning peach manurial experiment.

Fruit World, Melbourne, 1941, 42 : 5 : 11-2.

Five years' results of manurial trials with Pullars' Cling peaches, 14 years old at the start, growing at Kyabram, Victoria, show consistent advantages due to sulphate of ammonia given at the rate of from 2-4 lb. per tree in spring or in spring and autumn. Potash has so far had no significant effect upon yield. The treatments were replicated 6 times. The need for sowing some sort of crop between rows for incorporation as green manure is pointed out. Large apricots will require 4-5 lb. sulphate of ammonia while pears will well repay even larger quantities.

1116. BAGENAL, N. B. 581.111 : 634.1/7-2.19

Feeding the fruit tree—new light on an old subject.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 87-8.

The author contrives excellently to put across briefly and in simple language the system devised by the biochemist for diagnosing minor element deficiencies in the orchard by means of spectrographic examination and injection.

1117. REUTHER, W. 634.1/7-1.83

Effect of certain orchard practices on the potassium status of a New York fruit soil.

Soil Sci., 1941, 52 : 155-65, bibl. 14.

The use of liberal amounts of straw mulch or farm manure on orchard soils markedly increases the exchangeable potassium content. Heavy straw mulch increases slightly the exchange capacity and base saturation of the soil compared to sod or cultivation methods of soil management. In the few instances studied the exchangeable potassium level of the soil was reflected by the potash content of the foliage of the orchard trees associated with it. The high potassium content of mulch material should be given more attention in the evaluation of the effects of mulching as an agricultural practice. [From author's summary.]

1118. STEPHENSON, R. E., AND SCHUSTER, C. E. 634.1/7-1.8

Laboratory, greenhouse and field methods of studying fertilizer needs of orchard soils.

Soil Sci., 1941, 52 : 137-53, bibl. 6.

Quick chemical tests for measuring available plant nutrients in the soil are less satisfactory than greenhouse trials on small soil samples. Greenhouse trials require 6-10 weeks and give fairly definite information as to soil deficiencies for any particular plant. The sunflower is a useful indicator plant in greenhouse trials especially for those deficiencies likely to affect cover crops in the orchard. Miniature field plots giving opportunity for many replications are also very useful for quickly obtaining data which may serve as a basis for fertilizer recommendations. This work is exploratory in character, and the results should be used in setting up more permanent long-time trials on a larger scale. Accompanying the greenhouse studies physical and chemical soil studies should be made relating to depth, capillary and non-capillary porosity and aeration throughout a 10-foot profile.

1119. BRADT, O. A., AND DICKSON, G. H. 634.11-1.416.1

Some factors affecting the nitrate content of an orchard soil.

Sci. Agric., 1941, 22 : 61-7, bibl. 11.

An experiment was laid down in 1928 at the Ontario Horticultural Experiment Station to study the extent to which apple orchard cultivation may be reduced. This report deals with nitrate nitrogen determinations made since 1936. Two treatments, namely minimum cultivation in which the orchard is sown with some cover crop in mid-May and regular cultivation or cultivating till July followed by sowing with a similar cover crop, were compared. Under minimum cultivation there was a reduction of nitrate nitrogen content of the soil from late June to early August. In the regular cultivation plots the higher nitrate level delayed fruit maturity, reduced colour and caused greater loss through dropping, while terminal growth was increased and prolonged. Cultivating the soil from May to early July as compared with scraping to keep down weeds did not consistently increase or decrease the nitrogen or moisture supply. There were no appreciable differences in soil moisture between minimum and regular cultivation.

1120. HUGHES, C. W., AND FORD, O. W. 631.83

Effect of temperature of alcohol in determination of potash in fertilizers.

Industr. Engng Chem. (Analytical Edition), 1941, 13 : 233-4, bibl. 3.

When alcohol and acid are mixed in the proportion outlined in the official method for the determination of potash in fertilizers there is a sharp rise in temperature of about 8° C. which does not entirely disappear at the end of the 15-minute extraction period and gives an error, particularly under summer laboratory conditions. This can be prevented by mixing the acid and alcohol beforehand. In order to eliminate the effect of temperature it is advisable to cool the acid-alcohol mixture as well as the wash alcohol before using.

1121. ROGERS, W. S. 631.67

Making the best use of water in food production.*

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 82-3.

General observations based on work at East Malling. Whereas grass is a great water user and weeds should therefore be kept down, the author appears to doubt whether hoeing a clean surface is really advantageous except in the case of young plants. He commends the practice of intercropping during periods when rainfall exceeds water usage, i.e. roughly from the end of September to April in England. Irrigation of strawberries has proved successful, the overhead method, by hose sprinkler or oscillating pipe line, being more efficient than furrow irrigation. The aim should be to saturate the ground to the depth at which most of the roots are found and not beyond. It is noted that 1 inch of rain = 4 $\frac{3}{4}$ gallons per square yard and this will usually penetrate to a depth of about 1 foot, depending on the nature and wetness of the soil. A good soaking on one day is better than many light daily sprinklings.

1122. ROGERS, W. S. 634.1/7-1.874

Practical notes on cover cropping of orchards.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 83-6, bibl. 3.

Cover cropping treatments for maintaining and increasing the organic matter content of the soil in orchards are described, with cultural details. It seems likely that suitable crops for various conditions can be chosen from among the annual, short term and semi-permanent crops and swards that are available. [Author's summary.]

1123. U.S. DEPARTMENT OF AGRICULTURE. 631.542 : 634.1/8

Pruning hardy fruit plants.

Frmrs' Bull. U.S. Dep. Agric. 1870, 1941, pp. 46.

This bulletin was prepared by the pomology staff of the Division of Fruit and Vegetable Crops and Diseases, U.S. Horticultural Station, Beltsville, Md. Practical hints and directions are given for the proper pruning of apples, pears, quinces, peaches, cherries and plums, grape vines, currants, gooseberries, bilberries, raspberries, blackberries and dewberries. In American orchards pruning is done almost exclusively in the dormant season. The healing of pruning wounds is considered. It is found that wounds made in early spring heal the best. Wound dressings which are recommended for temporary protection should be applied with caution. Two dressings which have given good results are common shellac and a dressing made by heating together 8 parts by weight of resin and 3 parts by weight of sardine oil or raw linseed oil. This can be warmed and applied like paint. As regards vines, details are given of the 4-cane renewal or Kniffin system, the 3-wire canopy or Munson system and of training for arbours, pergolas, etc.

1124. CROCE, F. M. 634.14-1.542

Poda del membrillero. (Pruning the quince.)

Rev. B.A.P., 1941, 24 : 286 : 53, 55, 57, 59-60.

The pruning of the quince is discussed in a well-illustrated article under the following heads—bush form ; tree form ; at planting ; first spring pruning ; first winter pruning ; second winter pruning ; pruning for fruit production. The last should aim at obtaining an annual shoot growth of 30 to 60 cm. ; too vigorous pruning will cause fructification at the tips only and a considerable reduction in crop. The instructions are given very fully.

* Reproduced from *J. roy. hort. Soc.*, 1941, 66 : 279-81.

1125. BOWMAN, F. T.

634.1/7-1.55

The effective period for controlling fruit cropping.

J. Aust. Inst. agric. Sci., 1941, 7 : 56-60, bibl. 11.

Three years' trials with apples followed by two years' trials with prunes have indicated that cropping should be controlled by thinning within a period of approximately 35 days following full bloom. Should an excessive crop be carried beyond this stage the primordia of blossom buds for the succeeding year's crop will generally fail to appear two months later and the crop will be a light one. Other conditions play a part in light cropping but overbearing is the major antecedent. This predrop thinning, as it is called, should begin as soon as fruit buds can be distinguished at bud-burst and be completed by five weeks after the date of full bloom. It is essential that it should be finished before natural fruit drop sets in. One fruit should be left to every six spurs throughout the tree. The paper concludes with some discussion of blossom-reducing sprays.

1126. VYVYAN, M. C.

634.11-1.55 : 577.15.04

Reduction of the pre-harvest drop in apples by spraying with a growth substance.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 46-9, bibl. 1.

Spraying Worcester Pearmain, Beauty of Bath and Cox's Orange Pippin apple trees with α -naphthaleneacetic acid (strength $2\frac{1}{2}$ or 5 p.p.m.) a few weeks before picking resulted in reduced fruit drop. It was effective when mixed with petroleum oil spray and there is laboratory evidence that it is not inactivated by mixing with lime-sulphur or with bordeaux. The author notes, however, that synthetic growth substances tend to produce tumours in plants—though α -naphthaleneacetic acid is one of the least active in this respect—and that they may possibly have similar effects on human beings. There is no evidence that this is not the case. Tests are proceeding to determine the point as regards α -naphthaleneacetic acid. Until their conclusion it would seem unwise, in the author's opinion, to use the substance on fruits destined for human consumption.

1127. COLE, C. E., AND McALPIN, D. M.

634.1/2-1.55 : 577.15.04

The pre-harvest "drop" of fruit. Reduction by spraying.

J. Dep. Agric. Vict., 1941, 39 : 213-7.

The pre-harvest drop in Victoria is due to many causes, chiefly climatic, and often causes serious loss. Certain recommendations are made based on work in other countries and on local experiments. In Victoria it was found effective to spray the fruit 12-14 days before picking with 5 parts per million α -naphthaleneacetic acid or naphthalene acetamide, the spray being directed particularly at the fruit stalks, i.e. more downward than upward. White oil, 1 pint per 100 gallons, is effective as a spreader. Fruit intended for storage should not be left on the tree later than the normal picking time. The fruit saved will at least pay for the cost of application every year and in many seasons will pay handsome dividends.

1128. MACKENZIE, P. B.

634.11-1.55 : 577.15.04

Pre-harvest drop—prevention by hormone sprays.

Agric. Gaz. N.S.W., 1941, 52 : 380.

Spraying reduced drop and improved colour.

SMALL FRUITS, VINES AND NUTS.

1129. ISBELL, C. L.

631.531 : 634/5

The value of native material in breeding horticultural crops for Alabama.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 599-604.

The plants considered, many of which offer promise of usefulness to the breeder, include the following:—grapes, high and low bush bilberries, sour cherries, pecans, black walnuts, snap beans, onions, cowpeas, lettuce, turnips, water melons.

1130. JOLEY, L. E., AND CLOSE, A. W.

634.71-1.53

The rooting response of various species of *Rubus* to conventional methods of propagation.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 420-3, bibl. 4.

The results are tabulated of comparative tests of ordinary propagation methods with a number of raspberry and raspberry-like species and with blackberry and dewberry species of widely

different origin. The methods used were tip-layering, root-, stem- and leaf-bud cuttings and suckers. In a few trials with growth substances stimulation was greatest in those species which root best without treatment.

1131. CHILDS, W. H. 634.711-1.87

Production, berry size and growth of red raspberries as influenced by mulching.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 405-9, bibl. 5.

Mulching red raspberries, 3 varieties at Morgantown, W. Virginia, with rye, wheat and buckwheat straw resulted in increased production over plants under clean cultivation. It delayed ripening slightly.

1132. BEAKBANE, A. B., AND BAGENAL, N. B. 634.714/5

Some practical points in the growing of loganberries and blackberries.

A.R. East Mailing Res. Stat. for 1940, A24, 1941, pp. 89-91, bibl. 8.

The authors discuss the method of distinguishing between various berries, in particular the Loganberry and Phenomenal Berry. They call attention to two fairly recent imports from America, namely Youngberry (a cross between Phenomenal Berry and Mayes Dewberry) and Boysenberry. They deal with propagation, training and spraying against cane spot. They also consider the propagation, diseases and training of cultivated blackberries.

1133. WALKER, W. F. 634.714-1.535.7

The propagation of loganberry and similar *Rubus* hybrids by leaf bud cuttings.

Tasm. J. Agric., 1941, 12 : 51-5, bibl. 3.

The method of leaf bud propagation of the many *Rubus* hybrids now in commercial cultivation is described and illustrated. The advantages of this method over tip-layering are (1) the speed with which a large number of plants may be raised from selected clonal material ; (2) reduced interference with fruiting plants ; (3) the good results obtained with plants that do not top-layer readily ; (4) reduced chance of planting out rogues arising as chance seedlings amongst the layers.

1134. HILDRETH, A. C., AND POWERS, L. 634.75-2.111-1.523

The Rocky Mountain strawberry as a source of hardiness.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 410-2.

The taxonomy of the native Rocky Mountain strawberries growing wild in Wyoming, Colorado, Montana, New Mexico and Utah is somewhat confused but most of them appear generally to be of the *Fragaria cuneifolia* type. F_1 crosses with Gem, Dorsett and Fairfax, while varying greatly, show great promise for the production of hardier varieties of good quality.

1135. SHASHKINA, L. 634.75-1.541

Strawberry grafts. [Russian.]

Vernalisation, 1940, No. 6 (33), pp. 108-9.

The article describes experimental graftings on hybrid seedlings of strawberry with a view to the application of the Michurin method of mentors. The operation was carried out at three stages of growth, the beginning of the growing period, the beginning of the flowering period, and in August when the runners had produced well-developed rosettes. In the first two periods V-shaped cuts were made in the stock, the growing point of the tip being removed and replaced by that of the growing scion. In the third period (August) the grafts were made after obliquely cutting off the tip of the stock and removing the roots of the scion. The grafts were tied with cotton and placed in pots filled with sand above and turfy soil below. Results were as follows :—None of the 163 grafts made between 25 April and 27 April united ; of the 39 grafts made between 25 and 27 May eleven had united by 6 July ; of 63 grafts made 1-2 August, some united by 15 August but the scions subsequently formed roots of their own. It was thus established that successful results are obtainable from grafting in May when the strawberry plant is almost wholly lacking in root forming capacity, and that in August, the root forming capacity of the strawberry plant being exceptionally strong, the scions easily form their own roots.

1136. LOREE, R. E. 634.75
Results of strawberry plant spacing experiments.
Quart. Bull. Mich. agric. Exp. Stat., 1941, 23 : 251-3.
 The average yield of strawberries at East Lansing, Michigan, from spaced rows compared to matted rows was 1,000 quarts more per acre. The spacing was from 6 to 8 inches according to variety.
1137. FISCHER, H. E., DARROW, G. M., AND WALDO, G. F. 634.71 : 576.312.35
Further chromosome studies of some varieties of blackberries.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 401-4, bibl. 8.
- CHANDLER, F. B., AND HYLAND, F. 634.73
Botanical and economic distribution of *Vaccinium* L. in Maine.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 430-3, bibl. 6.
- DUIS, W. H. 634.73-1.521
Selection of the low-bush blueberry in West Virginia.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 434-7, bibl. 1.
- DARROW, G. M. 634.73-1.531
Seed size in blueberry and related species.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 438-40.
- NEWCOMER, E. H. 634.73 : 576.312.35
Chromosome numbers of some species and varieties of *Vaccinium* and related genera.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 468-70, bibl. 4.
- CLARK, J. H. 634.73 : 581.45
Leaf characters as a basis for the classification of blueberry varieties.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 441-6, bibl. 6.
- BAILEY, J. S., AND JONES, L. H. 634.73-1.436
The effect of soil temperature on the growth of cultivated blueberry bushes.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 462-4, bibl. 5.
- DOEHLERT, C. A. 634.73-1.8
Dates for applying blueberry fertilizer.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 451-4.
- KRAMER, A., EVINGER, E. L., AND SCHRADER, A. L. 634.73-1.8
Effect of mulches and fertilizers on yield and survival of the dryland and high-bush blueberries.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 455-61, bibl. 9.
- BAILEY, J. S. 634.73-1.821
The effect of lime applications on the growth of cultivated blueberry plants.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 465-7, bibl. 5.
- KRAMER, A., AND SCHRADER, A. L. 634.73 : 577.15.04
Effect of some nutrients, media and growth substances on the growth of the Cabot blueberry. [Abstract only.]
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 437.
- BRIGHTWELL, W. T. 634.73-1.542
Yield, size of berries, and season of maturity of the high-bush blueberry as influenced by severity of pruning.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 447-50.
- CRANE, J. C., AND HAUT, I. C. 634.75
Relationship of width of thinned row to productiveness and quality in the Blakemore strawberry.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 417-9.

- SCHRADER, A. C. 634.75 : 581.144.2
The pattern of strawberry root development under the matted and thinned row.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 413-6, bibl. 3.
- DERMEN, H., AND BAIN, H. F. 634.76 : 577.15.04 : 547.944.6
Periclinal and total polyploidy in cranberries induced by colchicine.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 400.

1138. FENNELL, J. L. 634.872
Future "Ideal" grapes.
J. Hered., 1941, 32 : 193-7.

The author discusses the chances of success in his attempts to produce a direct producer grape vine which will combine fruit quality with vine healthiness. He concludes that there is scarcely a problem in his quest which is not capable of solution.

1139. MAGOON, C. A., AND DIX, I. W. 634.8-1.534.4
On aerial propagation of grapes.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 388-92.

The rooting receptacle used was a modification of the marcottage box of May and Bullen. It was constructed of 3-inch paper mailing tubes with end discs of double-walled, corrugated cardboard. Exact instructions are given for making it and installing it on the vine. Success was achieved, both with current and last season's shoots, of all nine American varieties used. Planting out the rooted material presented no great difficulty, but under Beltsville, Md, conditions the plants derived did not make enough growth during the rest of the season to make the method practical in that latitude. The prompt development of roots by the method should, however, prove useful to cytologists as also for the rapid and sure propagation of particularly valuable seedlings, chimaeral material and varieties not rooting readily from cuttings.

1140. PENTZER, W. T. 634.8-1.55 : 577.15.04
Studies on the shatter of grapes with special reference to the use of solutions with naphthalene acetic acid to prevent it.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 397-9, bibl. 4.

Naphthalene acetic acid when applied in a preharvest spray or as a dip to freshly picked grapes failed to increase berry adherence significantly in any of the varieties tested, which included four *vinifera* varieties and one each of *labrusca* and *rotundifolia*. [Author's summary.]

1141. KORNEICHUK, V. D., AND PLAKIDA, E. K. 634.8-1.8
The effect of deeply placed fertilizers on the yield of grapes. [Russian.]
Proc. Lenin. Acad. agric. Sci. Moscow, 1941, No. 3, pp. 19-21, bibl. 1.

Trials carried out on vines in black clay soils in 1929 near Odessa, average rainfall 400 mm., showed no results from the application of fertilizers at a depth of 12-15 cm. The fertilizers were retained in the surface layers owing to the presence of carbonates. Similar surface retention was markedly noticeable in land set up in ridges and treated with acid phosphatic manures; in particular, superphosphate became less soluble when applied in autumn than when applied in spring. The effect of spring and summer rains on finely divided fertilizers was to raise them to the surface by capillary action rather than wash them down to the roots. Investigations showed that in this soil which is worked to a depth of 60-70 cm. the roots were most dense at a depth of from 20 to 50 cm., namely in the layer of greatest moisture content during the driest and hottest period of growth. As there are few vines to a plot, and yields from them vary considerably, in order to avoid the necessity for plots of unmanageable size, yields are almost always calculated from individual vines. Before the actual experiments took place, to facilitate accuracy in this task, preliminary determinations of fruit-bearing shoots and bunches were made. When pruning in spring, a definite number of fruit-bearing shoots was left on each vine. Thus the greatest possible accuracy with the smallest number of vines was ensured. In the authors' experiments each plot contained a single row of 30 vines. After certain of them had been excluded, 15 to 20 remained for the purposes of the experiment. With the vine branch as with fruit trees, formation of buds occurs in the preceding spring. Consequently the application of fertilizers affects neither the number of shoots nor their fruitfulness. There is evidence that

number of berries of the second and third bunches in the same period of growth, but not the number of bunches on each vine, may be increased by altering growing conditions. The average weight of a bunch is, therefore, one of the main factors to be considered as regards yield. In 1936 and 1937, 40 experiments in all were carried out. The methods applied were as follows :—Sections of large areas growing single varieties were selected, each containing 20 rows, of 30 vines each. Single-row plots were separated by a guard row. In one set of plots fertilizers were deeply placed, 35 to 40 cm., in furrows between the rows. In another set finely divided fertilizers, superphosphate and ammonium nitrate, were applied between the rows and ploughed in to a depth of 12 to 15 cm. From all plots in which fertilizers were applied deeply there was a marked increase in the average weight of bunch compared with that obtained from plots in which the fertilizers had been applied to a depth of from 12 to 15 cm. only. Deep furrows for the fertilizers between the rows had no ill effects on yield. The experiments showed that mineral fertilizers increase yield by 20% to 25%, but that their effect in southern clay black soils depends on moisture content at the depth at which they are applied. The rates of application recommended are 120 kg. of superphosphate and 60 kg. of ammonium nitrate per hectare.

1142. THERON, C. J. 634.8-1.517

Soil cultivation in vineyards.

Fmg S. Afr., 1941, 16 : 181-3.

The main advantages of shallow cultivation of vineyards in South Africa over deep cultivation is the availability of even light rainfall which never reaches the deeper roots and the fact that plant nutrients are mainly found in the top soil layer. Also the expense of cultivation is much less. Experiments show that after 9 years of manuring with various artificials none of them had penetrated lower than six inches. Vines require both deep and shallow roots and newly planted vineyards should be cultivated deeply by loosening the soil, not by bringing the subsoil to the top. Vineyards under irrigation are cultivated more deeply than those depending on rainfall only. Generally speaking, there should be a deep winter cultivation where the vines are dormant and a much shallower spring and summer one to avoid root damage. A system of cultivation is outlined for creating the best conditions for summer. Success in vineyard cultivation lies in working the soil neither too wet nor too dry.

1143. MANUEL, H. L. 664.85.872

Export grapes.

Fruit Cult. N.S.W., 1941, 11 : 131 : 5, 9.

Some of the wastage in New South Wales export grapes during the 1940 season is attributed to watering just prior to picking.

1144. WORLOCK, R. F. 634.51 : 581.145.1

Notas sobre la floracion del nogal de variedades comerciales. (Notes on the flowering of commercial walnuts.)

Rev. B.A.P., 1941, 24 : 283 : 7, 9-11.

The walnut is anemophilous and the male and female flowers are borne separately on the same tree but do not open at the same time, the male flowers finishing before the females are receptive. In seedling plantations which are always of mixed character this is unimportant for pollination, since the flowering period of the plantation is not uniform; the nuts, however, are of low commercial value. In grafted varieties which flower simultaneously provision should be made for pollinators in which the male flowers shed their pollen at the moment when the majority of the female flowers of the principal varieties are receptive. The pollinators should be planted round the outside of the plantation to ensure distribution of the pollen no matter from what direction the wind is blowing. To assist growers in the selection of pollinators the times of first opening, peak flowering and finish are tabulated for the male and female flowers of a series of plants of 5 commercial varieties in the Argentine. Time of flowering appears to be influenced by the vigour of the stock, that commonly used being seedling *Juglans nigra hindsii*, a variety which is by no means uniform in its general characteristics. In young plants the female flowers appear one or two years before the male, and failure to plant suitable pollinators is doubtless the reason why these early fruits so often fail to mature.

1145. HIGGINS, B. B. 634.58 : 581.175.11
Inheritance of seed-coat colour in peanuts.
J. agric. Res., 1940, 61 : 745-52, bibl. 7.

PLANT PROTECTION OF DECIDUOUS FRUITS.*

1146. WORMALD, H. 634.1/7 : 632.1 + 632.3/4 + 632.8
Recent research on diseases of fruit trees and bushes in Britain.
Trans. Brit. mycol. Soc., 1941, 25 : 4-25, bibl. 76.

In this presidential address before the British Mycological Society the author gives a concise and interesting account not only of diseases that have been studied in recent years in this country and of their control but also of the methods used to get that knowledge. The physiological, virus and parasitic diseases discussed include the following. *Physiological or functional*. Leaf scorch and the use of injection for diagnosis. *Virus*. Several viruses of strawberry and raspberry and reversion in black currant. *Parasitic*. 1. Bacterial. Crown gall, both on top and small fruits, noting investigational work on its control in nursery stock by mercurial compounds; dieback of stone fruits and blossom blights. 2. Fungal. Apple scab, development of work and surmounting of difficulties including that presented by spray injury; canker of apple and pear, its ramifications as eye rot and its connexion with scab; brown rot diseases and their identification; silver leaf; American gooseberry mildew, blue stripe wilt and cane spot of raspberry; red core and black root rot of strawberry. He draws attention to progress in laboratory methods of testing fungicides. He notes, moreover, the present tendency to explore every possibility of defeating particular diseases by the use of suitable rootstocks or other cultural methods in preference to grubbing diseased trees or bushes.

1147. ANON. 634.1/8-2.1/8
The grower's battle against disease.
Orchard. N.Z., 1941, 14 : 99-100.

A short survey of the Plant Research Station, Mt. Albert, Auckland, is given, principally as regards soils and layout, with some indication of the work planned and in progress.

1148. DETURK, E. E. 632.19
Plant nutrient deficiency symptoms. Physiological basis.
Industr. Engng Chem. (Industrial Edition), 1941, 33 : 648-53, bibl. 13.

A brief account is given of plant nutrition from the physiological aspect. The various deficiencies and their symptoms are then dealt with separately, Indian corn being used as a representative plant.

1149. DICKEY, R. D., AND BLACKMON, G. H. 634.25-2.19 : 546.47
A preliminary report on little-leaf of the peach in Florida—a zinc deficiency.
Bull. Fla agric. Exp. Stat. 344, 1940, pp. 19, bibl. 16.

Little-leaf control tests were carried out with the peach variety Jewel growing in fine sandy (acid) soil in Pasco County, Florida. Soil was treated with zinc sulphate, manganese sulphate and magnesium sulphate, separately and in combination. Only where zinc sulphate was used was there a significant and improved growth response. Foliage applications also were made with zinc sulphate and manganese sulphate both separately and in combination. Again only zinc sulphate proved successful. The zinc sulphate (89%) was applied to the soil at rates of $\frac{1}{2}$, 2 and 5 lb. per tree. The $\frac{1}{2}$ lb. rate proved sufficient, while the 5 lb. rate treatment resulted in slight but passing foliage injury. The successful zinc-lime spray was made by screening 5 lb. zinc sulphate into 100 gallons of water. Two and one-half pounds of finely ground hydrated lime and 1 lb. calcium caseinate were mixed in approximately 2 gallons of water and this was added to the spray tank which had already received the zinc. While spraying, the mixture must be kept stirred. Lead arsenate and sulphur can be added to the spray, if desired, to control curculio or fungous diseases.

* see also 1324.

1150. KILPATRICK, D. T. 634.25-2.19 : 546.711

Manganese deficiency in peaches.

Agric. Gaz. N.S.W., 1941, 52 : 151-2.

Manganese deficiency in peach, a limiting factor in growth and fruitfulness in N.S.W., is manifested as an intravenous leaf chlorosis. The leaves affected are usually small in size, and borne on spur extensions at the bases of laterals. A winter spray of 1 lb. manganese sulphate in 2 gal. water effected striking improvement. Experiments are in progress to test the efficacy of weaker concentrations and the period of efficiency.

1151. HOLBECHE, J. A., AND FERGUSON, S. W. 634.11 : 546.27

Apply borax with care.

Agric. Gaz. N.S.W., 1941, 52 : 429, 434.

The use of borax has given highly successful results in the control of cork in apples, but damage has resulted from incorrect application and excess dosages. The recommendations of the N.S.W. Department of Agriculture are :—As a soil dressing $\frac{1}{4}$, $\frac{1}{2}$ or 1 lb. of borax to each small, medium or large-sized tree respectively should be spread very evenly on the soil in a ring 2 feet wide beginning 2 to 3 feet from the butt of the tree and worked into the soil with a suitable instrument. Severe damage to butt and roots has resulted where borax, especially in excess amounts, has been applied too close to the trunk. Young non-bearing trees should as a rule not be treated with borax.

1152. SCOTT, L. E. 634.8-2.19 : 546.27

An instance of boron deficiency in the grape under field conditions.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 375-8, bibl. 4.

Abnormal foliage symptoms in a number of American vines, Ontario, Lenoir, Catawba and many others growing at the Sandhill Experiment Station near Columbia, S. Carolina, were traced to boron deficiency and were eliminated by the application of borax. Varieties differed greatly in susceptibility.

1153. OFFICERS OF THE FRUIT BRANCH, QD. 634.1/7-2.111

Frost prevention by orchard heating.

Qd agric. J., 1941, 54 : 490-4.

Some methods of orchard heating suitable for Queensland are discussed and the installation of an alarm thermometer is described.

1154. WHITTAKER, E. C. 634.1/7-2.111

Repair of damage by snow in Batlow orchards.

Agric. Gaz. N.S.W., 1941, 52 : 326-9.

An unprecedented fall of snow in N.S.W. occurred in 1935 when the apples were still carrying a heavy crop and created tremendous havoc. In older bearing trees limb breaks were the chief injury but younger trees were mostly split from the fork to the ground and laid out flat in two or three sections. In one orchard only 15% of 300 Granny Smith retained some semblance of their original form. The methods of tree surgery by which all these trees were repaired with little or no check to their subsequent growth are fully described.

1155. SCHELLENBERG, A. 634.8-2.111

Über 100,000 Frostschirme aus Stroh in einem Rebberg. (Straw covers for frost protection in the vineyard.)

Schweiz. Z. Obst- u. Weinb., 1941, 50 : 272-6.

Very successful protection was afforded to vines growing at Klein-Andelfingen against spring frost in the spring of 1941 by the use of straw covers, one to each staked vine. These covered the vines, but in most cases did not actually reach the ground. Their action is apparently as follows :—1. They prevent the plant getting wet, with consequent ice formation. 2. They check radiation. 3. They maintain a slightly higher temperature than that outside. Such a system demands, of course, the appropriate pruning.

1156. WARREN, G. H.

632.183

Shelterbelts.*E. Afr. agric. J.*, 1941, 7: 8-19, bibl. 6.

The question of shelterbelts as a contribution to the long-term improvement of land in East Africa is discussed in the light of information already obtained in various countries, particularly in Russia and U.S.A. Experiments carried out by the author with a simple apparatus in a Kenya locality at 4,700 ft. are discussed. Russian work tends to show that shelterbelts of suitable trees afford protection from wind, aid in ripening grain, reduce evaporation, retain snow, decrease the range of temperature fluctuations, attract rain, increase the productivity of waste lands, control soil erosion. Evidence that shelterbelts raise the water table is insufficient, while the theory that they attract rainfall is still controversial. The article is of considerable interest, the more so because much of the data provided is obtained from Russian literature and is thus in a language unfamiliar to most.

1157. McMUNN, R. L., AND KELLEY, V. W.

634.1/2-2.111-1.541

Prepare to bridge-graft injured trees.*News Letter Ill. St. hort. Soc.*, 1941, No. 2, pp. 1-2.

Much cold injury was caused to fruit trees in Illinois in the winter of 1940-41. This is briefly described and suggestions are given as to the kinds of injury in which bridge grafting is likely to be necessary. Instructions are given for selecting and storing scion wood.

1158. ZELLER, S. M., AND EVANS, A. W.

634.2-2.8

Vein clearing, a transmissible disease of *Prunus*.*Phytopathology*, 1941, 31: 463-7.

A graft-transmissible vein-clearing disease of *Prunus* has been discovered in the Pacific Northwest affecting cherry and prune trees. The disease is expressed through rather definite foliage, branch and fruit symptoms. Trees with infection of several years' standing show considerable dwarfing, while the fruit is misshapen or absent, though there may have been considerable flowering. No insect vector has been found. The symptoms of vein-clearing and mottle-leaf diseases of cherry are briefly compared.

1159. REEVES, E. L.

634.25-2.8

Mottle leaf, a virus disease of cherries.*J. agric. Res.*, 1941, 62: 555-71, bibl. 8.

The mottle leaf virus of cherry investigated recently in U.S.A. and British Columbia has so far proved transmissible only by grafting or budding. Bing, Napoleon, Waterhouse and Lambert are the only four varieties in which infection has so far been observed under field conditions. Nineteen varieties were inoculated and none proved immune, although many were highly tolerant. The virus was transmitted to peach when growth union was obtained between cherry bud and peach stock. Such unions failed to form with other stone fruits and the virus was not transmitted. The insect vector is unknown. The virus was not inactivated by hot water treatment of bud sticks at 46° C. for 60 minutes or at 49° for 10 minutes, but the buds so treated only lived long enough to effect union with the stock. The only control advocated is the removal of infected trees. The fact that affected trees often bear good crops for 1 or 2 years after the symptoms are visible often leads to a delay in removal resulting in a spread of infection.

1160. HILDEBRAND, A. A.

634.75-2.8

The reaction of *Fragaria virginiana* to the virus of yellow-edge.*Canad. J. Res.*, 1941, 19, Sec. C, pp. 225-33, bibl. 5.

Clones of *Fragaria virginiana*, the common wild strawberry of Canada, were found to differ very widely in their resistance to yellow-edge when infected by runner grafting to the symptomless carriers, Premier and Glen Mary. All stages from complete deterioration to a virtually complete resistance were shown. The object of the tests was to find an indicator plant which would stand up to local conditions, the English strawberry Royal Sovereign proving unsuitable for Canada. The resistant clones of *F. virginiana* should prove useful in breeding. Their resistance also extends to root rot.

1161. CHAMBERLAIN, G. C. 634.711-2.8
A necrotic "fern-leaf" mosaic of raspberry.
Sci. Agric., 1941, 22: 119-24, bibl. 8.

A new virus disease affecting Cuthbert raspberry in Canada is described. There are four distinctive symptoms, namely, a spot necrosis of the older leaves, retarded bud development and foliation, ring-spot, blotch mottle and an unusual stunting of the young leaf growth, resulting in a "fern-leaf" appearance. The disease is readily transmissible by grafting but no insect vector has yet been traced. It is not yet of economic importance and may represent a chance infection from an unusual source.

1162. WORMALD, H. 634.1/7-2.1 + 2.3/4
Notes on plant diseases in 1940.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 55-8.

Among phenomena noted are severe frost effects on tree and bush fruits, *Monilia cinerea* on Conference pear, storage scab on gas-stored apples, eye rot of apples associated with *Botrytis cinerea*, shoot wilt (probably *Cylindrocladium*) in layered plum rootstocks, American gooseberry mildew (*Sphaerotheca mors uvae*) on an ornamental *Ribes* and bacterial blight (*Pseudomonas juglandis*) on walnut.

1163. WORMALD, H., AND MONTGOMERY, H. B. S. 634.13-2.3 + 2.4
Bacterial blossom blight of pear trees.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 58-9.

Several organisms seem to produce somewhat similar symptoms. They include *Pseudomonas prunicola*, *Sclerotinia laxa*, *Bacillus barkeri*.

1164. IVANOFF, S. S., AND KEITT, G. W. 632.314: 634.11 + 634.13
Relations of nectar concentrations to growth of *Erwinia amylovora*, and fire blight infection of apple and pear blossoms.
J. agric. Res., 1941, 62: 733-43, bibl. 12.

The optimal concentration of sugars for growth of the fire blight pathogen, *Erwinia amylovora*, in 1/400 c.c. drops of artificial nectar in Van Tieghem cells was 2-4%. Growth rapidly decreased with increased sugar concentration, none occurring at 30%. Infection of unwounded pear or apple blossoms inoculated by placing small droplets of bacterial suspension in the nectar occurred freely only when the sugar concentrations were in the lower range encountered in natural nectar. [From authors' summary.]

1165. KEITT, G. W., AND IVANOFF, S. S. 632.314: 634.11 + 634.13
Transmission of fire blight by bees and its relation to nectar concentration of apple and pear blossoms.
J. agric. Res., 1941, 62: 745-53, bibl. 19.

In the experiments reported bees freely transmitted fire blight, *Erwinia amylovora*, from infected to healthy flowers of apple and pear but only when the sugar concentration of the nectar was in the lower range encountered in nature. From the fact that healthy blossoms were not always infected by the contaminated bees when the nectar was at a favourable concentration it would seem that other factors are also important in limiting blossom blight transmission by bees. The most successful of the three methods of transmission used is fully described.

1166. HILDEBRAND, A. A., AND WEST, P. M. 634.75-2.3-1.874
Strawberry root rot in relation to microbiological changes induced in root rot soil by the incorporation of certain cover crops.
Canad. J. Res., 1941, 19, Sec. C, pp. 183-98, bibl. 15.

Strawberry plants of Premier were grown in naturally infected root rot soil in which consecutive crops of several agricultural plants had been turned under, in steam sterilized soil from the same source and in soil that had received farmyard manure. The incidence and severity of root rot was found to be closely correlated with soil treatment. Plants grown in sterilized soil remained free from disease. Plants in the manure, corn, red clover, timothy and untreated soil series all became diseased, the severity of the attack increasing in the respective series in the order named. There were marked differences in the microbiological equilibria of the different soil series and the investigations have shown the incidence of certain groups of bacteria to be

definitely correlated with the intensity of the root rot factor. The need to broaden the concept of the microbiological factor in relation to strawberry root rot is stressed.

1167. WEST, P. M., AND HILDEBRAND, A. A. 634.75-2.3-1.874
The microbiological balance of strawberry root rot as related to the rhizosphere and decomposition effects of certain cover crops.
Canad. J. Res., 1941, 19, Sec. C, pp. 199-210, bibl. 26.

Soybean grown as a cover crop and incorporated with strawberry root rot soil caused a striking reduction in the incidence of root rot in the strawberry Premier and a drastic shift in the bacterial equilibrium of the soil. Red clover was ineffective in these respects. The ability of soybean to control strawberry root rot, therefore, seems to depend primarily on a carbohydrate type of breakdown in diseased soil causing a highly favourable shift in the microbiological equilibrium. [From authors' summary.]

1168. NISIKADO, Y., HIRATA, K., AND KIMURA, K. 634.37-2.411
On a *Phytophthora* rot of fig.
Ber. Ohara Inst., 1941, 8 : 427-42, bibl. 23.

The paper deals with the morphology, physiology and pathogenicity of the fungus causing fruit rot of fig in Japan. It is referred to as *Phytophthora palmivora* Butler. Inoculation experiments showed that the fungus affects the fruit, leaves and young buds of fig, in the presence or absence of wounds, and also other fruits such as apple, Japanese pear, persimmon, egg plant and potato tubers. The minimum temperature for the development of the fungus is 5-10° C., the optimum 27° C. and the maximum 32-33° C.

1169. IKATA, S. 632.42 : 634.13
Characteristics and control of *Venturia* disease of Japanese pears. [Japanese.]
Agric. Hortic., 1940, 15 : 133-44 [summarized in English, *Jap. J. Bot.*, 1941, 11 : (169)].

In the author's investigations the propagation of the pear scab fungus, *V. pirina*, was found to take place exclusively through the conidia and ascospores. The conclusion is reached that infection in early spring is chiefly due to overwintering conidia and later to ascospores. Optimum temperatures for mycelial growth were found to be $\pm 20^{\circ}$ C., maximum 25-39° C., minimum 10° C. For the germination of conidia 22-23° C. was found optimum, at 28° C. no growth was noticed, though it can take place at 8° C.

1170. KINOSHITA, S. 634.23-2.42 : 577.15.04
Growth substances derived from a *Taphrina cerasi* which was causing witches' broom on Japanese cherry (*Prunus yedoensis*). [Japanese, German summary.] *Bot. Mag., Tokyo*, 1940, 54 : 58-63 [summarized in German, *Jap. J. Bot.*, 1941, 11 : (158)].

Cultured extracts of *Taphrina cerasi* were extracted with ether and the solution used on oat seedlings resulting in a check to growth of the roots but not of the coleoptiles. Control experiments with heteroauxin resulted in checked growth of roots and coleoptiles. It is impossible to say whether the witches' broom symptoms were due to this substance.

1171. WORMALD, H. 632.482 : 634.1/7 + 633.79
The grey mould of fruit and hops. Some possible sources of infection.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 59-61, bibl. 4.

An account is given of grey mould (*Botrytis cinerea* Pers.) on fruit and hops, with special reference to a dry eye rot of apples. Grey mould has been found on the dandelion, black bryony and brambles as well as on other hosts. Strains of *Botrytis cinerea* isolated from a number of host plants have been inoculated into apples and all readily produced rot. Measures of control are outlined. [Author's summary.]

1172. HUBER, G. A., AND BAUR, K. 632.42 : 634.2
Brown rot on stone fruits in Western Washington.
Phytopathology, 1941, 31 : 718-31, bibl. 4.

Sclerotinia laxa and *S. fructicola* were found responsible for brown rot of stone fruits in western Washington. Isolations made from and inoculations made into different parts of apricot, cherry, peach and prune trees and fruits are here recorded.

1173. McWHORTER, O. T. 632.42

Sulphur dust and spray controls brown rot.

Bett. Fruit, 1941, 36 : 1 : 5, 13.

Sulphur fine enough to pass through a 325 mesh (or finer) used as a dust or a wettable spray will control brown rot of peaches, cherries and prunes. The dust is used at the rate of $\frac{1}{2}$ lb. for an average-sized tree or the wettable sulphur spray at 6 lb. to 100 gal. water. Three applications in all should be given, starting 5 weeks before the peaches ripen and thereafter at intervals of 10 days. Failures are nearly always traceable to one or more of the following reasons. 1. The use of unsuitable materials. 2. Application after brown rot has set in. 3. Inadequate or inefficient application.

1174. EVANS, A. W., AND OWENS, C. E. 634.23-2.4

Incidence of *Sclerotinia fructicola* and *S. laxa* on sweet cherries in Oregon.

Phytopathology, 1941, 31 : 469-71, bibl. 2.

1175. MASSEE, A. M. 632.6/7 : 634.1/7

Notes on some interesting insects observed in 1940.

A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 61-5.

The insects discussed are strawberry rhynchites (*Rhynchites germanicus*), shot hole borer (*Anisandrus dispar*), hop strig maggot (*Contarinia humuli*), black currant midge (*Dasyneura tetensi*), apple capsid (*Plesiocoris rugicollis*), hop frog hopper (*Evacanthus interruptus*), apple leaf hopper (*Typhlocyba froggatti*), plum leaf hopper (*Eupteryx stellulata*), cuckoo-spit insect (*Cercopis sanguinea*), black currant eelworm (*Aphelenchoides ribis*). There was a noticeable absence of strawberry and *Rubus* aphides, apparently owing to prolonged cold and frost.

1176. MOORE, J. B., AND OTHERS 634.11-2.654.2

Control of Pacific mite and European red mite on apples.

J. econ. Ent., 1941, 34 : 111-6, bibl. 4.

Selocide, made by dissolving selenium in potassium and ammonium sulphide solution, affords an efficient control in Washington, U.S.A., for the mites *Tetranychus pacificus* and *Paratetranychus pilosus* on apples. It has been used for some years for the control of mites on grapes and citrus. Only one application per year would normally be required. No appreciable quantities of selenium were found in washed or unwashed fruit even after spraying 3 times.

1177. MASSEE, A. M., AND GREENSLADE, R. M. 633.79-2.654.2

The control of the hop red spider.

A.R. East Malling Res. Stat. for 1940, A24, 1941.

Control by lime-sulphur spray is outlined.

1178. DU PLESSIS, C., AND NOLTE, M. C. A. 632.728

Laboratory experiments in the improvement of poison baits for hoppers of the red locust : 1936-37.

Sci. Bull. Dep. Agric. S. Afr. 227 (*Locust Research Series* 8), 1941, pp. 44, bibl. 14.

LEA, A., AND NOLTE, M. C. A. 632.728

Laboratory experiments on poison baits for the brown and the red locust : 1937-38.

Sci. Bull. Dep. Agric. S. Afr. 230 (*Locust Research Series* 9), 1941, pp. 56, bibl. 25.

1179. FOTIDAR, M. R. 632.752

The San José scale and its control in Kashmir.

Indian Fmg, 1941, 2 : 234-7.

The bionomics in Kashmir are described of the San José scale (*Aspidiotus perniciosus*), which since its arrival in 1910 has caused many valuable orchards to be destroyed. In Kashmir spraying in the dormant season with Diesel oil $1\frac{1}{2}$ gal., potash-fish-oil soap 1 lb., water $1\frac{1}{2}$ gal. with 7 parts of water added or 24 parts of added water in summer gives good results. Spraying

is compulsory and under Government supervision, the growers supplying the material and the Government the machinery and technical labour.

1180. RAHMAN, K. A., AND KHAN, A. W. 632.753
Biology and control of woolly aphid, *Eriosoma lanigerum* Hausm.
(Aphididae: Rhynchotha) in the Punjab.
Indian J. agric. Sci., 1941, 11: 265-78, bibl. 6.

The biology of the woolly aphid, an imported pest, in the Punjab, is discussed. Three insect predators are found to exercise a definite check on it. The aerial forms can be controlled by spraying with resin soap and the root forms by paradichlorobenzene applied in a 4 in. deep trench and covered with earth.

1181. GREENSLADE, R. M. 634.75-2.753
Strawberry aphid and the weather in 1940.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 65-6, bibl. 1.

Although *Capitophorus fragariae* was nearly exterminated by severe weather in January and February 1940, during which the ground temperature fell to -5° F., it was just as numerous as usual by September of that year. Similar observations showed that the effects of aphid control by vaporized nicotine persisted for a year.

1182. MASSEE, A. M., AND GREENSLADE, R. M. 634.75-2.753
Work at East Malling on the control of the strawberry aphid.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 92-4, bibl. 6.

The successful control of the vector of strawberry virus diseases, *Capitophorus fragariae*, by the use of vaporized nicotine (applied under a big drag sheet) is discussed.

1183. STEER, W., AND MOORE, M. H. 632.754: 634.11 + 634.22
Spray damage and apple capsid control by winter petroleum.
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 76-81, bibl. 12.

On plums the time of winter petroleum oil spraying was less important than the number of applications, thus two applications were much more harmful than one. On apples results were similar but less pronounced. Late spraying is imprudent owing to the uncertainty of the weather and of the risk of scorching if there is delay, although late spraying is actually more effective against capsid. It is thought that earlier spraying should be effective, provided at least 6% of oil is used.

1184. ANON. 634.2-2.76
Possible solution of the *Capnodis* root-borer problem.
Agric. Bull., Palestine, 1941, January-March, pp. 185-6.

Apparently the young larvae of the root-boring beetle *Capnodis* are unable to penetrate dry sifted soil or dry sand. The beetle is a severe pest of stone fruit in Palestine and if the experiments in turning this discovery to practical use in control are successful the benefit to fruit growers will be immense.

1185. KLEE, H. 632.76: 634.711
Der Prachtkäfer *Agrilus communis* Obenb. als Himbeerschädling. (*Agrilus communis* as raspberry pest.)
Z. PflKrankh., 1940, 50: 564-5.

Damage by the larvae of *Agrilus communis* on raspberry canes is reported. Cutting off and burning the infected stems is recommended. R.M.I.

1186. KERR, T. W. 634.75-2.76
Sand arsenical mixtures for controlling white grubs and their effect upon the growth of strawberries.
J. econ. Ent., 1941, 34: 405-11, bibl. 4.

Lead arsenate sand 1-20 is found to be the most effective sand-arsenical mixture for controlling white grubs (*Phyllophaga* spp.) in strawberries and causes no significant difference from untreated plants in runner production.

1187. YOTHERS, M. A. 634.11-2.76
***Dyslobus tanneri* van Dyke, a pest of apple in the Northwest.**
J. econ. Ent., 1941, 34 : 468-70.
 A weevil which appears to be becoming more noticeable.
- FINNEY, D. J. 632.765
Wireworm populations and their effect on crops.
Ann. appl. Biol., 1941, 28 : 282-95, bibl. 3:
- SNAPP, O. I. 634.25-2.768
Value of the petal-fall application of lead arsenate in controlling the plum curculio (*Conotrachelus nenuphar*) on peach in the South.
J. econ. Ent., 1941, 34 : 418-9, bibl. 1.
 Treatment highly successful in reducing numbers.
1188. GREENSLADE, R. M. 634.723-2.77
The black currant leaf midge (*Dasyneura tetensi* Rübs).
A.R. East Malling Res. Stat. for 1940, A24, 1941, pp. 66-71, bibl. 9.
 The black currant leaf midge is becoming more common and is of importance as a pest in the nursery. Observations are here recorded on its life history. It is confined to *Ribes nigrum* and certain varieties, e.g. Goliath, are particularly susceptible. Possible control measures are discussed.
1189. ALLMAN, S. L. 632.77 : 634.1/7
Control of Queensland fruit fly [*Strumeta tryoni*].
Agric. Gaz. N.S.W., 1941, 52 : 281-2, bibl. 2.
 The comparative efficiency of the recognized methods of control of Queensland fruit fly was tested on caged trees, an uncaged tree being included in the trials as a check on the treatments. It was clearly indicated that foliage poison spray is more effective than traps baited with vanilla-ammonia lure as a means of protecting fruit, and tartar emetic is apparently more effective in destroying flies than sodium fluosilicate.
1190. WORTHLEY, H. N., AND STEINER, H. M. 632.78
Lead arsenate "dynamite" codling moth sprays in Pennsylvania.
J. econ. Ent., 1941, 34 : 256-63, bibl. 6.
 "Dynamite" sprays are mixtures in which the suspended solid—lead arsenate or cryolite—is wetted by the oil so that it sticks to the sprayed surface. By increasing the quantity per tree spray deposits can be built up to high levels, the run-off continuing to consist entirely of water. Field experiments covering 4 years are described. Problems of residue removal, scab control and spray injury have not been complicated by the use of these sprays which have saved about one-fifth of the cost of the usual programme of 4 cover sprays.
1191. GINSBURG, J. M. 632.78
Experiments with chemicals on codling moth larvae in the dormant season.
J. econ. Ent., 1941, 34 : 263-68, bibl. 7.
 In the laboratory in New Jersey dichlorethyl ether possessed high toxicity to codling moth larvae in concentrations of 0.75% or higher, but was a failure in the orchard because of lack of penetration. Kerosene, the cheapest solvent tested, in concentration of 17% or higher killed 93-100% of the larvae both on the tree and in the laboratory, in fact kerosene by itself at this concentration proved as toxic to the larvae as was the kerosene mixture containing dichlorethyl ether.
1192. WOODSIDE, A. M. 632.78
Studies of codling moth cocooning habits.
J. econ. Ent., 1941, 34 : 420-4, bibl. 13.
- PRATT, B. G. 632.78
Control of codling moth with arsenate of lead and certain forms of rotenone and pyrethrum.
J. econ. Ent., 1941, 34 : 424-6.

- GOULD, E., AND GEISSLER, G. H. 632.78
Hibernating codling moth larvae.
J. econ. Ent., 1941, 34 : 445-50, bibl. 12.
- O'KANE, W. C., AND SMITH, H. W. 632.944
A new fumigant, 1-1-dichloro-1-nitroethane.
J. econ. Ent., 1941, 34 : 438-9.
1193. SCHWEIG, C. 634.8-2.78
Experiments on control of grape berry moth (*Polychrosis botrana*) attacking wine grapes.
Agric. Bull., Palestine, 1941, January-March, pp. 181-3, bibl. 2.
 In Palestine, on a basis of 2 dustings, fluosilicates and cryolite give a good control of grape berry moth on wine grapes. A first dusting of calcium arsenate followed by an application of fluosilicate is not recommended as bringing the residue content too high.
1194. BECKWITH, C. S. 634.76-2.78
Control of cranberry fruit worm on blueberries.
J. econ. Ent., 1941, 34 : 169-71.
Mineola vaccinii Riley, or cranberry fruit worm, an economic pest of cultivated blueberries in New Jersey, does not so much damage the fruit as render it by its presence repugnant to purchasers. It was controlled 94% by 2 aeroplane dustings with pyrethrum on 29 May and 2 June at the rate of 6 lb. per acre. No attempt was made to discover the minimum dose.
1195. HIXSON, E. 634.51-2.78
The walnut datana (*Datana integerrima*).
Bull. Okla agric. Exp. Stat. B246, 1941, pp. 29, bibl. 6.
 Great damage was done by the walnut datana to black walnut and pecan tree foliage, resulting in poor crops and even death in Oklahoma in 1935, 1936 and 1937. In 1938 natural predators, especially *Trichogramma minutum* and *Telenomus ichthyuræ*, destroyed a high percentage of the pest and in 1939 also there was little damage. In 1940 the pest again became important. An account of life history and notes on control are given here. Spraying with 3 lb. lead arsenate, 6 lb. lime and 100 gallons of water was found to be effective. Half a pint of fish oil per 100 gallons spray increased the adherence of the arsenic.
1196. HARTZELL, A., AND WILCOXON, F. 632.951
A survey of plant products for insecticidal properties.
Contr. Boyce Thompson Inst., 1941, 12 : 127-41, bibl. 35.
 Products of 150 species and varieties of plants were tested as possible insecticides.
1197. SHAW, F. R. 638.12 : 632.95
Bee poisoning : a review of the more important literature.
J. econ. Ent., 1941, 34 : 16-21, bibl. 46.
1198. MINISTRY OF AGRICULTURE, LONDON. 632.951.4
Specifications and methods of analysis for tar oil winter washes.
Bull. Minist. Agric. Lond. 122, 1941, pp. 22, 6d.
 The specifications and methods of analysis given here were evolved by a joint committee composed of 3 members representing the Ministry and 4 representing the Association of British Insecticide Manufacturers. Specifications and methods of analysis for both the miscible oil (black fluid, type and the stock emulsion (mayonnaise) type are given. They have been accepted by the Ministry and by the Association, and members of the Association and most other manufacturers of tar oil washes have agreed that their products shall conform to these standards.
1199. CHAPMAN, P. J., PEARCE, G. W., AND AVENS, A. W. 632.951.4
The use of petroleum oils as insecticides. II. Some factors affecting the amount of oil deposited on apple bark in dormant spraying.
J. econ. Ent., 1941, 34 : 207-12, bibl. 5.
 The concentration of oil in the spray mixture, the kind and amount of the emulsifier-wetting agent used and the quantity of spray applied to the tree are considered to be most important

in affecting the amount of oil deposited on apple bark in the dormant treatment of apple trees and are discussed.

1200. STULTZ, H. T., AND PATTERSON, N. A. 632.951
Some preliminary experiments on the insecticidal value of certain plant extracts, more particularly those of *Delphinium Brownii* Rydberg;
Sci. Agric., 1941, 21 : 776-82, bibl. 1.

The alkaloid of *Delphinium brownii* was found to be the most promising of 7 different plant alkaloids tested for insecticidal value against mosquito and potato beetle, *Lepidomyza lineata* Say. It is less effective as a contact poison and more effective as a stomach poison and feeding repellent than nicotine sulphate. It has no value as a fumigant. Water solution of the delphinium alkaloid and the spray residues lose their toxicity sooner than those of nicotine sulphate, though this defect might be overcome by the adsorption of the alkaloid on-activated carbon.

1201. YIP, J. S. 632.951.1
Extraction and determination of pyrethrin I in ground pyrethrum flowers.
Industr. Engng Chem. (Analytical Edition), 1941, 13 : 107-8, bibl. 4.

A simple and inexpensive modification of an apparatus for the extraction and determination of pyrethrin I in ground pyrethrum is proposed and illustrated.

1202. CUNNINGHAM, G. H. 632.952 : 634.1.8
The use of sulphur as a fruit spray.
Orchard. N.Z., 1941, 14 : 5, 7, 8.

The paper (acknowledged without further indication to "Plant protection by the aid of therapeutants") describes the effect of sulphur, especially colloidal sulphur, in dealing with plant pests. Four methods of measuring particle size are described. The effects on fungi, insects and plants are discussed.

1203. SHIPPY, W. B. 632.951.952
Florida spray.
Pr. Bull. Fla agric. Exp. Stat. 547, 1940, pp. 4.

A note on the preparation and use of a combined fungicide-insecticide containing per 100 gallons soap 10 lb., bluestone 2½ lb., strong ammonia 26-29%, 1 quart.

1204. SHAW, H., AND STEER, W. 632.951.4 : 632.6.7
Dinitrocresol and other dual purpose winter washes.
A.R. East Mailing Res. Stat. for 1940, A24, 1941, pp. 72-5, bibl. 12.

Of the different materials tested a 3 : 5-dinitro-*o*-cresol (D.N.C.) wash was found to be the cheapest method of controlling aphides, apple sucker, winter moth, red spider and rapid bags by winter spraying.

VEGETABLE GROWING, FIBRES, DRUGS, ETC.

1205. TAYLOR, H. V. 635.1/7
The planning of vegetable production in war-time.
Chem. Industr., 1941, 60 : 641-3.

The Commissioner for Horticulture discusses the problems involved in the arrangement of a national programme of vegetable production during the war years. It appears that the less nutritious a vegetable is the more the public yearns for it, while the cabbage almost always in plentiful supply, is tolerated but not enjoyed. The author suggests that increased acreages of late savoys, kales and winter spinach are necessary, that the nutritionist should produce some information on the food value of the popular cauliflower and broccoli crops, which so far seem to have escaped his attention, that the acreage of carrots is increasing as a result of public recognition of the value of the vegetable and that the production of pulse crops is on the low side. Large quantities of crops for flavouring purposes can be used and over 50,000 acres of land has had to be spared to render wartime food attractive to nose and palate.

1206. THOMPSON, A. C. 635.1/7

Modern vegetable production methods.

Mkt Grs' J., Louisville, Ky, 1941, 67: 95-7.

Market gardening on a large scale with the aid of machinery is discussed under the following heads. Development of machinery on vegetable farms. Modern tractor improvements. Equipment for ground preparation. Fertilizing methods. Planting standard multiple rows. Portable irrigation. Insect and disease control. Harvesting equipment. Methods of preparation for market. Improvement in mechanization.

1207. BROWN, H. D., AND ARNOLD, C. 663.61 : 581.084.1

Soilless culture and its application to the gardening industry.

Mkt Grs' J., Louisville, Ky, 1941, 67: 118-9, 121, 123.

An outline is given of the methods used in commercial hydroponics, special attention being paid to the gravel culture system.

1208. MINNUM, E. C. 577.15.04 : 635.1/7

Effect of several growth substances on vegetable crop plants.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38: 477-8.

Treatment of the seed of various vegetable seeds and plants with several indole acids in dust and liquid form failed to give any beneficial results at all at Ithaca, N.Y.

1209. ANON. 635.1/7

War-time food crops.

Market Grower, 1941, 18: 51: 3-4.

The article deals with the harvesting of main crop beet, red cabbage planting, the growing of an American onion variety, and the cultivation of turnips under glass.

1210. OGILVIE, L. 635.1/7 : 632.1 + 632.3/4 + 632.8

Diseases of vegetables.

Bull. Minist. Agric. Lond. 123, 1941, pp. 84, 1s. 6d.

This replaces *Bulletin* 68, last issued in 1935. The present bulletin is written mainly for growers, with emphasis on the description of symptoms, on the influence of cultural practices, on the occurrence of diseases and on control measures. Only the diseases more commonly met with in England and Wales are dealt with. It is usefully indexed for quick reference to particular parasites or non-parasitic phenomena. In the text the diseases are referred to by their common names, the scientific name being provided in brackets. Some nine pages are devoted to details of particular control measures, such as soil sterilization, seed treatment and different fungicides, etc.

1211. GREEN, D. E. 635.1/7 : 632.3/4

Hygiene in the war-time vegetable garden.

J. roy. hort. Soc., 1941, 66: 251-5, 290-4, 326-32.

The papers represented here are Nos. VII, VIII and IX* of a series of articles dealing with diseases of more important vegetable crops and methods of control. The crops are as follows:—VII. Lettuce; VIII. Cucumbers and vegetable marrows; IX. Onions, leeks, shallots, chives and garlic.

1212. WALKER, J. C. 635.1/7 : 632.3/4

Disease resistance in the vegetable crops.

Bot. Rev., 1941, 7: 458-506, bibl. 255.

The nature of disease resistance in plants is discussed under the headings:—Disease escape, which is not true resistance though often wrongly interpreted as such; Exclusion of the pathogen; Resistance due to host-parasite interaction, the commonest and most important form of resistance; Variability of the pathogen; and Relation of environment to disease resistance. Most of the paper is concerned with resistance in specific vegetable crops.

* The subjects of earlier papers are given in *H.A.* 11: 443 and 813.

1213. JOHNSON, F. 632.8 : 632.53

Transmission of plant viruses by dodder.

Phytopathology, 1941, 31 : 649-56, bibl. 9.

Six of seven tested viruses were transmitted from diseased to healthy plants by the natural parasitism of dodder, *Cuscuta campestris*. Dodder can be used in transmission studies with viruses not readily transmitted by mechanical means or in cases where grafting is not possible, as between plants not closely related taxonomically. A higher percentage of transmission is obtainable when the virus will multiply in the tissues of the parasite. This occurs in some viruses but not in others.

1214. FULTON, R. W. 632.8 : 581.144.2

The behaviour of certain viruses in plant roots.

Phytopathology, 1941, 31 : 575-98, bibl. 37.

Certain differences in virus behaviour in roots as compared to behaviour in the above ground portions of plants are demonstrated.

1215. NAYLOR, A. W. 612.014.44 : 633.8 + 633.41

Effects of some environmental factors on photoperiodic induction of beet and dill.

Bot. Gaz., 1941, 102 : 557-75, bibl. 21.

When different groups of dill plants were exposed to different intensities of continuous light their responses in stem elongation were almost proportional, up to 300 foot-candles, to the amounts of light received. With beet the plants flowered only after receiving 900 foot-candles for 6 weeks. Temperature was also shown to have an effect in altering the responses of dill to a long photoperiod. The higher temperatures were necessary, apparently, to change physiological conditions sufficiently to bring about stem elongation and flowering.

1216. CHERNOV, G. I. 633.491 : 575.42

Selection and breeding in seed-potato cultivation.

Proc. Lenin Acad. Agric. Sci. Moscow, 1941, No. 7, pp. 6-8.

The highest yields were obtained from large tubers or, best of all, from tubers of the highest yielding plants and from summer sowings.

1217. MICHENER, H. D. 633.491 : 547.313.2

Shortening of dormancy in potato tubers.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 523-9, bibl. 6.

In trials in Hawaii treatment with 0.8 to 1.0 c.c. liquid ethylene chlorohydrin per kg. of potatoes for 3 days hastened germination in every case without causing injury with dormant potatoes. The trials, which are described, included a number of treatments and lengths of applications on dormant and non-dormant tubers.

1218. GRIKHUTIK, M. I. 633.491 : 581.143.26.03

Vernalisation of potato varieties used in industry. [Russian.]

Proc. Lenin Acad. Agric. Sci. Moscow, 1941, No. 2, pp. 18-21.

The author conducted a series of experiments with a view to ascertaining the effect of vernalization on the yields of late-maturing varieties of potato used for industrial purposes. The experiments began in 1934 at a White Russian Station with the best industrial variety, Wohltmann. Vernalization was carried out by sprouting seed potatoes for 35 to 45 days in a warm temperature of 12° C. to 18° C. and in a well-lighted situation, each plant occupying 60 × 45 sq. cm. There were 3 to 4 replications. The plots were dressed annually with dung and mineral fertilizers, and the crop was harrowed, hoed, and earthed up twice. Sprouting of the unvernallized potatoes occurred 25 to 29 days after planting, of the vernalized potatoes 6 to 8 days earlier. Budding, flowering, tuber formation, drying-off of the haulms, all were noticeably earlier in the treated lots. Observation of development began 65 to 75 days after planting, at which time, and at intervals of 10 days, 25 to 45 plants were lifted. In each instance the yield from the vernalized seed was the largest. At the first lifting the average increment was about 42.5%, at the second 28%, at the third 21.7%. Vernalization also increased the starch content. In 1937 several

varieties were tested. All gave a positive reaction to vernalization. Compared with early and medium varieties, late varieties yielded a large increment at the final lifting. Vernalization also markedly increased the yield of industrial varieties, Lorkh and Wohltman, in 1938 and 1939. The following results were then achieved. Management contributed in no small measure to these results. Thus it was found that the effect of vernalization increased with increase in soil moisture and quantity of fertilizers. Contrary to the view expressed in previous scientific literature, experiments carried out in 1939 on Lorkh and Wohltman varieties showed that vernalization produced effects on small seed potatoes. When lifted on 25 July vernalized small potatoes (Lorkh) showed an increase of 43% or 26.5 centners per hectare, with an increase in starch content of 1.2%, while those of the autumn harvest increased by 6% or 6.7 centners per hectare. The increased yields of Wohltmann at corresponding dates were 16.5% and 7%. Contrary also to statements hitherto made, it was found after experiments covering a period of 3 years, that yields from vernalized half tubers were equal to, if not greater than, those from unvernallized whole tubers. The conclusions reached are that vernalization of late varieties markedly increased the yield of tubers and their starch content, that it is most effective at the autumn lifting of late varieties, that it produces positive results from medium and large seed, and that the yield from halved medium-sized tubers is equal to, if not greater than, that from whole unvernallized seed tubers of the same size.

1219. WESTOVER, K. C. 633.491-1.8

The influence of fertilizers on potato tuber shape.

Amer. Potato J., 1941, 18 : 155-63, bibl. 5.

At West Virginia Agricultural Experiment Station high N treatment caused tuber elongation in favourable potato seasons. High P increased length under unfavourable climate conditions and width in a good season. Potash increased width under favourable circumstances and was ineffective otherwise.

1220. McCUBBIN, E. N. 633.491

Influence of sprouts on plant emergence, growth, tuber-development and yield of potatoes.

Amer. Potato J., 1941, 18 : 163-74, bibl. 5.

With early planting or a long growing season the yields of sprouted, desprouted or dormant potato seed would probably be equal. In a short growing season yield would probably be highest from sprouted and lowest from dormant seed. Storing in light or dark for one month before planting had no effect on the relative response of the 3 classes. Delay in emergence, subsequent growth or maturity resulting from the removal of short sprouts is caused by loss of the sprout as a plant rather than the loss of food reserves or growth substances stored in the sprout.

1221. MILLER, J. C., AND MCGOLDRICK, F. 612.014.44 : 633.491

Effect of day length upon the vegetative growth, maturity and tuber characters of the Irish potato.

Amer. Potato J., 1941, 18 : 261-5.

Under field and controlled conditions plantings of potato under short day conditions showed less vegetative growth, matured earlier and had more regular-shaped tubers than potatoes under long day conditions. The latter, however, had the higher total yield. In the study of seedlings parental combinations had a marked influence on whether the resulting seedlings fell into the short or long day group.

1222. DAVIS, G. E. 633.491 : 581.144 : 581.05

The effects of certain environmental factors on tuberization in the wild potato, *Solanum commersonii*.

Amer. Potato J., 1941, 18 : 266-9.

A report of the first of a series of experiments to determine the factors which affect tuber formation. Results so far indicate that tuberization is a short day process which is benefited by day and night temperature of 77° F. and reduced by day and night temperatures of 56° F., regardless of whether temperatures are considered singly or in combination.

1223. MACVICAR, R., TOTTINGHAM, W. T., AND RIEMAN, G. H.

633.491 : 581.192 : 546.27

The comparative boron content of potato leaves and tubers produced under different cultural conditions.

Amer. Potato J., 1941, 8 : 249-53, bibl. 8.

Tuber analyses alone give little information regarding variations in total ash or boron content which may occur in leaf and stem. There appears to be a relation between the locality and the boron content but whether the response is caused by varying amounts of available boron in the soil or some other factor is not yet clear and is still under experiment.

1224. RUSSELL, E. J., AND GARNER, H. V.

633.491-1.8

The Rothamsted experiments on the manuring of potatoes. Part I. Effects of nitrogenous, phosphatic, and potassic manuring.

Emp. J. exp. Agric., 1941, 9 : 195-215.

The early experiments which began in 1876 are first briefly discussed. The main body of the paper deals with the modern experiments beginning in 1930. The experiments are classified as continuous experiments in which 6-, 4-, and 3-course rotations are used to eliminate soil deterioration and "shifting" experiments to study the manurial problems arising in actual farm practice. Shifting experiments differ from continuous ones in that neither the site nor the design of the experiment remains constant. They are made under farm conditions where the potatoes happen to be growing. Fourteen tables setting out the various results are presented and discussed.

1225. FIFIELD, W. M., AND WOLFE, H. S.

633.491-1.8

Fertilizer experiments with potatoes on the marl soils of Dade County [Florida].

Bull. Fla agric. Exp. Stat. 352, 1940, pp. 40, bibl. 4.

Results are recorded of 10-year fertilizer trials at the Sub-tropical Experiment Station on Bliss Triumph potatoes.

1226. HAWKINS, A., CHUCKA, J. A., AND BROWN, B. E.

633.491-1.811.9

Minor element studies on potatoes in Maine.

Amer. Potato J., 1941, 18 : 234-9, bibl. 13.

Comparatively small amounts of boron and nickel added to potato fertilizers were found to be toxic. Small amounts of nickel showed a non-significant tendency to increase yields. Manganese, copper and iron had little or no effect on potato yields.

1227. BALD, J. G., AND NORRIS, D. O.

633.491-2.8

Obtaining virus-free potatoes.

J. Coun. sci. industr. Res. Aust., 1941, 14 : 187-90, bibl. 5.

Successful attempts to obtain tubers of Up-to-Date potato variety in Australia absolutely free from virus x are recorded.

1228. BRIEN, R. M.

633.491-2.41

"Leak", a watery wound-rot of potatoes in New Zealand.

N.Z. J. Sci. Tech., 1940, 22 : 228A-31A, bibl. 10.

A disease due to *Pythium ultimum* which occurs in stored potatoes, particularly those stored at temperatures of 20° C. to 30° C. Control consists in avoiding injury during harvesting and in transit, and storing in a cool, dry and well-ventilated place.

1229. WERNER, H. O.

633.491 : 612.014.44

A test of the possibilities of photoperiodic induction of blooming in Triumph potatoes and the morphological consequences.

Amer. Potato J., 1941, 18 : 144-9, bibl. 5.

WERNER, H. O., AND DUTT, J. O.

633.491-2.19

Reduction of cracking of late crop potatoes at harvest time by root cutting or vine killing.

Amer. Potato J., 1941, 18 : 189-208, bibl. 35.

- DYKSTRA, T. P. 633.491-2.8
Report on potato virus diseases in 1940.
Amer. Potato J., 1941, 18 : 221-30, bibl. 21.
- BLACK, L. M. 633.491-2.8
Specific transmission of varieties of potato yellow-dwarf virus by related insects.
Amer. Potato J., 1941, 18 : 231-3, bibl. 5.
- BARTON-WRIGHT, E. 633.491-2.8
Studies in the physiology of the virus diseases of the potato. IV. A comparison of the nitrogen relations of healthy and crinkle potatoes ; together with some observations on the nitrogen relations of a "carrier" variety.
Ann. appl. Biol., 1941, 28 : 229-37, bibl. 6.
- LUTMAN, B. F. 633.491-2.3
Actinomyces in potato tubers.
Phytopathology, 1941, 31 : 702-17, bibl. 15.
- MARTIN, W. H., AND DAINES, R. H. 633.491-2.3
Potato scab [*Actinomyces scabies*].
Circ. N. Jersey agric. Exp. Stat. 415, 1941, pp. 10.
- RUEHLE, G. D. 633.491-2.3
Bacterial soft rot [*Erwinia carotovora*] of potatoes in Southern Florida.
Bull. Fla agric. Exp. Stat. 348, 1940, pp. 36, bibl. 13.
- RAMSEY, G. B. 633.491-2.4
***Botrytis* and *Sclerotinia* as potato tuber pathogens.**
Phytopathology, 1941, 31 : 439-48, bibl. 11.
1230. ERWIN, A. T., SHEPHERD, G., AND MINGES, P. A. 633.492-1.57
Handling and marketing Iowa sweet potatoes.
Bull. Ia agric. Exp. Stat. P32, 1941, pp. 76-103.

The sweet potato is the second most important vegetable grown in the United States. It is grown in a few limited areas, both dry-fleshed and wet-fleshed varieties but mainly the former, in parts of south-eastern Iowa. The authors consider the most likely ways in which the grower in Iowa can profitably handle and dispose of his crop. Notes are given of consumer varietal preferences.

1231. PIKE, K. A. 633.52
Fibre flax. Investigations at the Waite Institute.
J. Dep. Agric. S. Aust., 1941, 44 : 496-507.
- Trials with the Liral Crown variety of flax at the Waite Agricultural Research Institute are reported for 1937-40. Early sowing appeared to be an essential factor for maximum yields. The highest yield of underseeded flax straw has been obtained with a seed rate of 80 lb. per acre ; seed yields have been highest following a seed rate of 40 lb. per acre. The optimum fertilizer dressing on the red-brown loam overlying clay, on which the crop was grown, was 1 cwt. to 1½ cwt. superphosphate per acre.
1232. COLHOUN, J., AND MUSKETT, A. E. 633.52-2.4+2.1
Powdery mildew, hail damage and heat canker of flax.
Gärners' Chron., 1941, 110 : 30, bibl. 15.
- The first appearance of powdery mildew on flax in the field for the British Isles is recorded in 1940 from Northern Ireland though it had been observed in greenhouses a year or two previously. Hail damage in Co. Antrim produced, through bruising, rather large knotty swellings on the stems, usually at one point only, frequently causing breaking of the stem. This is also reported for the first time for these islands. Heat canker observed in June 1939, in Co. Tyrone caused constriction of the cortical tissues. Adventitious roots usually developed from the swellings.
1233. POGGENDORFF, W. H. 633.525.1
Ramie (*Boehmeria nivea*).
Agric. Gaz. N.S.W., 1941, 52 : 253-5.

Ramie can be grown successfully on the far north coast of New South Wales. Under Australian conditions ramie growing cannot be profitable as long as decortication has to be done by hand.

A company in N.S.W. is about to operate commercially a mechanical decorticator which it is hoped will prove a success. So far in every country the fibre produced mechanically has always been inferior to the hand-combed Chinese product. Degumming, i.e. removing the gum cementing the fibres together, can now be done chemically (in China and Japan the gum is removed by repeated washings in water and bleaching in sunlight). A rough idea of the type of this chemical process is given but the details are trade secrets. Ramie spinners now usually do their own degumming in order to reduce injury to the fibre. An account is given of the cultural requirements of ramie.

1234. OWEN, F. V.

633.63-1.535

Asexual propagation of sugar beets.

J. Hered., 1941, 32 : 187-92, bibl. 4.

The asexual propagation of sugar beets is usually accomplished by the use of cuttings made from the crown buds. Rooting, however, is comparatively slow and the number of cuttings that could be made from a single beet limited. Cuttings of sections of the semi-vegetative seed stalks seem to dispose of both these objections. The initiation of the seed-stalk and the lengthening of the internodes in biennial varieties is produced by prolonged exposures at 40°-50° F. accompanied or followed by exposure to long photoperiods (preferably continuous light). Temperature and light requirements show wide variation and depend on the generic composition of the beets. There are also other minor complications which are described. The rapidity of flowering of these cuttings can be controlled by adjusting the temperatures and photoperiods before and during rooting. The cuttings are easily rooted with ordinary horticultural treatment under glass. Certain growth substances accelerate rooting but in practice are unnecessary.

1235. STOKER, G. L., AND TOLMAN, B.

633.63-2.19 : 546.27

Boron deficiency relations in sugar beets grown for seed in Oregon.

J. Amer. Soc. Agron., 1941, 33 : 657-65, bibl. 6.

DAVEY, A. E., AND LEACH, L. D.

633.63-2.4

Experiments with fungicides for use against *Sclerotium rolfsii* in soils.

Hilgardia, 1941, 13 : 523-47, bibl. 15.

Fungicides for control of sugar beet *Sclerotium* rot.

1236. ALLARD, H. A.

633.822 : 612.014.44

Further studies* of the photoperiodic behavior of some mints (*Labiatae*).

J. agric. Res., 1941, 63 : 55-64, bibl. 1.

Observations made at Arlington, Va., show that of the aromatic oil species of mint studied *Monarda didyma* and *M. spicata* are day-neutral, *Mentha citrata*, *M. piperi* and *M. spicata* have decided long-day tendencies, flowering being entirely inhibited on shortened days. *Mentha arvensis* and the variety of *M. piperita* from North Carolina are inclined to be day-neutral.

1237. COCHRAN, H. L.

633.842 : 581.145.2

Growth of the Perfection pimienta fruit.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 557-62, bibl. 39.

Growth was observed in the Perfection pimienta (*Capsicum frutescens*) fruit from the early bud stage to maturity. A period of rather slow growth is followed by one of rapid growth, the rate of which tends to decrease with approaching maturity. The references given concern growth in a large number of fruits.

1238. LACHMAN, W. H., WEST, E. A., AND SNYDER, G. B.

633.842

The effect of methods of growing and transplanting the plants on the yield of peppers [*Capsicum frutescens*].

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 554-6, bibl. 10.

1239. GARDNER, C. A.

633.85

Chenopodium oil.

J. Dep. Agric. W. Aust., 1941, 18 : 32-3.

Chenopodium ambrosioides var. *anthelminticum*, wormseed, is a common waste land weed in parts of western Australia and is also cultivated in U.S.A. and the Dutch East Indies as a source

* See *Ibidem* 18 : 553 and 23 : 871 and *Tech. Bull. Dep. Agric. U.S.* 727, H.A., 11 : 21.

of the drug *Chenopodium*, an important vermifuge especially valuable in cases of hook worm. Tests made with the Australian plant have shown that the quality of the oil is satisfactory. A botanical description and illustration of the plant are given.

1240. PLATENIUS, H., AND KNOTT, J. E. 635.25
Factors affecting onion pungency.
J. agric. Res., 1941, 62 : 371-9, bibl. 6.

These studies on Texas- and Ithaca-grown onions were made in order to classify the most important commercial varieties as regards pungency and to determine how much such factors as soil conditions, temperature, moisture supply and storage influence pungency in any one variety. Inherent characteristics had the greatest effect on pungency, thus some varieties were found to contain nearly 3 times as much volatile sulphur as others. Type of soil was all important, onions grown in peat soil were about twice as pungent as the same variety grown on sandy soil, those grown on loam or sandy loam being intermediate. A correlation was established between the volatile sulphur content of the onions and the total sulphur content of the soil. Overhead irrigation or a high water table resulted in a small consistent lowering of the volatile-sulphur content of the onions. In cold storage over a period of several months onions slowly increased in pungency.

1241. GIBBS, J. G., BAYLIS, G. T. S., AND BLACKMORE, L. 635.25 : 632.452
Experiments in control of onion-smut (*Urocystis cepulae* Frost).
N.Z. J. Sci. Tech., 1940, 22 : 162A-6A, bibl. 9.

Several formalin drip treatments reduced onion smut infection by 50 to 75%. Generally speaking a formula of 1.0% to 1.6% formalin proved better than one of 0.8% formalin. Dusts were ineffective. Lime-sulphur as a drip treatment was inferior to formalin. Attempts to eradicate by soil disinfection were unsuccessful.

1242. WOODMAN, R. M. 635.34 : 631.8
The nutrition of the spring cabbage.
Ann. appl. Biol., 1941, 28 : 181-8, bibl. 3.

The experiments were carried out on Sutton's Harbinger spring cabbage grown in sand under glass. Reduced nitrogen resulted in diminished yields and later maturity, excess nitrogen caused severe marginal scorch. Reduction of phosphorus had no effect until a low level was reached causing a sudden drop in yield. Potassium deficiency caused severe marginal scorch, necrotic spots, leaf drop and immaturity. Absence of boron caused the plants to be sickly, amber green, with narrow leaves having a relatively broad edging of brilliant scarlet mauve with patches of this colour on the undersides, in addition to a number of other severe symptoms which are described. Such plants died early.

1243. WALKER, J. C., McLEAN, J. G., AND JOLIVETTE, J. P. 635.34/5 : 632.19 : 546.27
The boron deficiency disease in cabbage.
J. agric. Res., 1941, 62 : 573-87, bibl. 27.

Internal breakdown of the pith was the most noticeable feature in cabbage and especially cauliflower plants grown on boron-deficient soil in the field. The early maturing varieties suffered worst of the cabbages tried. The applications of 20 lb. borax per acre eliminated the trouble for practical purposes and this effect held good in the second season. The symptoms of boron deficiency in young cabbage plants grown in sand culture in the greenhouse are noted.

1244. LARSON, R. H., AND WALKER, J. C. 635.34 : 632.8
Ring necrosis of cabbage.
J. agric. Res., 1941, 62 : 475-91, bibl. 10.
 Comparison with other crucifer viruses.

- GILES, W. F. 635.34/35
Cauliflower and broccoli. What they are and where they come from.
J. roy. hort. Soc., 1941, 66 : 265-77.

1245. STUBBS, L. L. 635.34/35 : 632.4

Some diseases of cabbages and cauliflowers.

J. Dep. Agric. Vict., 1941, 39 : 208-12, bibl. 10.

The cause and control of the following diseases of cabbages and cauliflowers in Victoria, Australia, are described :—blackleg (*Phoma lingam*), clubroot (*Plasmodiophora brassicae*) and whiptail, a physiological disease of cauliflowers. This last is very prevalent on acid soils and heavy dressings of agricultural lime at, say, 1½-2 tons to the acre have successfully controlled it. The symptoms are very characteristic. The plants are straggly and undernourished with narrow, much crinkled, abnormally thick and brittle leaves. The heads, if developed at all, are small and unmarketable.

1246. KOHLS, H. L., AND RATHER, H. C. 635.54 : 631.531

Growing chicory seed.

Quart. Bull. Mich. agric. Exp. Stat., 1941, 23 : 243-50.

The conventional European practice, in growing chicory for seed, of overwintering the roots in storage, having proved expensive and unsuitable in Michigan the seed was sown in early spring in 28-inch rows in barley or oats just previously put in at the ordinary rate of seeding. The grain was cut in August and the chicory weathered the ensuing winter perfectly, giving yields more than enough to justify domestic seed production. The stand was in its second year of seed production when the article was written, the yield being fully equal to that of the first.

1247. CURRENCE, T. M., AND LARSON, R. 635.611

Refractive index as an estimate of quality between and within muskmelon fruits.

Plant Physiol., 1941, 16 : 611-20, bibl. 4.

An interesting but not altogether successful attempt to estimate quality in muskmelons both by taste and by refractive index.

1248. ZECHMEISTER, L., AND POLGÁR, A. 635.615 : 577.16

The carotenoid and provitamin A content of the watermelon.

J. biol. Chem., 1941, 139 : 193-8, bibl. 7.

The carotenoids of watermelon pulp were chromatographed and estimated. The provitamin A content was about 0.5 mg. of β-carotene per kilo of pulp. [From authors' summary.]

1249. BEWLEY, W. F. 635.64

Tomatoes, cultivation, diseases and pests.

Bull. Minist. Agric. Lond. 77, 1st edit. amended, 1941, pp. 78, 2s.

This bulletin has had various amendments made to it since its first issue in 1934 and in this last reprint the advice on HCN fumigation has been revised. It concerns the cultivation of tomatoes in large and small glasshouses, the management of the heating, prevention and control of pests and diseases, and the construction of tomato houses. Notes are included on varieties and soils.

1250. BARNES, H., AND PREST, R. L. 635.64

Planting tomatoes.

Qd agric. J., 1941, 55 : 292-6.

Some cultural experiments with tomatoes in Queensland undertaken by the Department of Agriculture are described. 1. Winter crop. Variety, Salads Special. Transplanting direct from seedbed to field, the usual custom, versus pricking out into 3" deep trays and transplanting to field from the trays at a later period with a block of soil 2½" × 2½" × 3" on the roots of each plant. The yield of the tray plants averaged 1 lb. more per plant than that of the others, or, on an acreage basis, £72 per acre increase. Both classes matured at the same time. 2. Spring crop. Variety, Break of Day. The above experiment was repeated with the same results. The system known as "blocking" was compared with it. The seedbed is thinned to 3 inches. The remainder when large enough to plant out are cut out with a hoe with cubes of soil attached, trayed for transport to the field and planted immediately. In this case the yield was 2 lb. per

plant over the normal system. 3. Plants raised in cardboard tubes 4" deep \times 3" and transplanted with the ball intact gave a yield of 1.48 lb. per plant over unthinned bare-rooted plants transplanted direct from the seedbed. The tubes have several disadvantages and are not recommended. The experiments are to be repeated.

1251. BARRONS, K. C. 681:634/5:581.145.2
Nomographic charts for the rapid computation of measurement ratios of horticultural products.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38:589-92, bibl. 4.

An illustrated description is given of a nomograph prepared by the author for determining the shape index of tomatoes and its use is described. An adaptation of this apparatus may be used for measuring cabbage heads. Other uses are considered.

1252. HARRIS, G. H. 635.64:551.56:581.192
The effect of climate in British Columbia on the chemical composition of tomatoes.

Sci. Agric., 1941, 21:679-83, bibl. 6.

Investigations at the Plant Nutrition Laboratory of the University of British Columbia have shown that the warmer districts with much sunshine yield tomatoes with the greatest vitamin C content and that the vitamin C content for any given variety is correlated with sugar content. Besides the effect of locality there is also a varietal difference in the food value of tomatoes.

1253. KHAZINA, E. P. 635.64:631.541.11
Alteration of the fruit form in the seed progeny of grafts. [Russian.]
Vernalisation, 1941, 1 (34), pp. 84-9.

1. A study of grafts of the seed generation of the tomato variety, Humbert, on *Solanum nigrum*, *Lycium barbarum*, *Petunia violacea*, *Nicotiana tabacum* and *Datura stramonium* showed that, as a result of interaction between the stock and scion, vegetative hybrids could be obtained, i.e. new plants with distinct characters. 2. By a repetition of grafting of a plant of the seed generation which had already been grafted, it was possible to obtain more profound changes of character. 3. Plants of the first, and especially of the second seed generations of tomato grafts, may undergo a series of changes resulting from grafting, even though the fruit, from the seeds of which they had been grown, differed little from the control. 4. Plants of the seed generation underwent a series of changes in the fruit (shape, size, number of locules, form of the trusses, chemical composition). 5. Diversity in shape, size and number of locules were to be observed in plants of the seed generation of grafts not only in the progeny of a single fruit but even of a single plant. 6. Both in the first and second seed generations of grafts of tomato on *S. nigrum* and *L. barbarum*, plants were observed to possess economically useful characters of interest to the practical plant breeder. [Author's summary.] The above experiments were carried out at the Plant Breeding Institute, Odessa.

1254. AVAKJAN, A. A., AND JASTREB, M. G. 635.64:631.541.11
Hybridization by means of grafting. [Russian.]
Vernalisation, 1941, 1 (34), pp. 50-77, bibl. 5.

1. In seeds and vegetatively propagated offspring of grafted plants many inherited characters develop, which take after the mentor. This confirms Michurin's statement, according to which the offspring of grafted plants bear hybrid characteristics. 2. The behaviour of offspring of grafted plants shows that hybrids obtained by vegetative reproduction have many of the biological peculiarities of sexual hybrids. 3. The obtaining of hybrids vegetatively shows with unmistakable clearness that the changing of inherited qualities of plants results from a change of a specific character in the metabolic process. Such a conclusion necessitates a revision of the physiologist's view of sexual reproduction and not only explains the way in which new characters arise, but reveals a host of new possibilities of controlling the transmission of hereditary characters. [Authors' summary.]

The above experiments were carried out at the field station at Gorki Leninskie of the Lenin Academy of Agricultural Science of the U.S.S.R., and at the Plant Breeding Institute, Odessa. The chief plants used in the experiments were a Mexican tomato (No. 353), as well as a number

of tomato varieties including a wild "black currant-like" variety from Mexico, *Solanum nigrum*, *S. demissum*, *S. acaule*, *S. punae* and several potato varieties.

1255. WESTOVER, K. C. 635.64:1.542

The effect of the topping of young tomato plants on fruit set and yield.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38: 517-22, bibl. 3.

Topping Early Baltimore and Marvelous tomato plants, the latter a late variety, by pinching off the main stem above the second leaf of a number of uniformly selected plants 10-14 days before setting in the field tended to result in an increase in early yields but a reduction in total set of fruit and yield in most cases.

1256. SAYRE, C. B. 635.64:631.8:577.15.04

Nutrient or starter solutions and vitamin B for transplanting tomatoes.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38: 489-95, bibl. 1.

A small amount of readily available complete fertilizer in solution poured round tomato roots on transplanting was very effective in conjunction with ordinary manuring in stimulating early growth and increasing yields at Geneva, N.Y. The use of vitamin B had no result.

1257. ANDROSOVA, M. P. 635.64:632.111

Increasing the hardiness of tomatoes.

Proc. Lenin Acad. agric. Sci. Moscow, 1941, No. 1, pp. 24-8.

In this article the results of experiments down to 1940 are set forth. The aim of these experiments, which began in 1936, was to produce tomato plants which could be cultivated earlier than any hitherto known in the central and more northerly regions of the R.S.F.S.R., particularly the vicinity of Moscow. The most widely grown varieties were chosen. They were sown in boxes, which were taken into the open, at intervals of about a fortnight from 1 October to 11 April. Boxes containing sowings of 15 March and 1 April were placed in deep frames and frames of medium depth. One box of each variety and of each date of sowing was left in the open till spring. Germination on a large scale began in the varieties of Bison, Best of All and Bierette from sowings of 1 February; and the later the sowing, the more quickly the plants emerged. After pricking out, the plants were subjected to various temperatures, those in deep frames to 15° C. and 25° C., and others in medium frames to 10° C. and 15° C. In April the temperature was lowered by ventilation and raising the lights in daytime. Compared with the plants in medium frames, those in deep frames were superior in growth, size and development, foliage and weight of dry matter. Tomato plants were transplanted in the open on 17 May, before the end of the spring frosts. One night, a week later, the temperature dropped to -3° C. The plants withstood the frost well. The average percentage of unaffected plants was 90.8, that of frostbitten plants 9.2. With 93.2% of unaffected plants Bison was the hardiest. After transplanting in the open on 17 May prolific foliage and fruit appeared. The average harvest from each hectare was 66 tons. A large percentage of plants left in the open frames, and not subjected to previous hardening, perished. For example, out of 314 Bison plants only 15 or 4.8% were unaffected. Plants from hybrid seeds withstood low temperatures better than varieties left in frames. No marked difference in the hardiness of any of the plants, resulting from dates of sowing, stages of growth, and methods of applying fertilizers, was noticeable. In addition to hardening under natural conditions, plants of different varieties were placed for various periods in a cold chamber having a constant temperature of -5° C. In the majority of cases the percentage of unaffected plants counted on the following day was 100% and in no instance was less than 91%. In all varieties there were individual plants which responded differently to low temperatures. A small number withstood a temperature of -8° C. and some, notably Bison, the maintenance of it at this level for 24 hours. The plants withstood more easily a sharp lowering of temperature to -8° C. for one to two hours than they did a temperature of -4° C. for a longer period. The conclusions are reached that crops grown in low temperatures may be as heavy, if not heavier, than those produced under normal conditions, and that resistance of plants to low temperatures is strengthened not only by previous hardening and by appropriate selection of seeds and plants but also by the physiological condition of the plants at the moment of their being exposed to freezing.

1258. FOSTER, A. C., AND TATMAN, E. C. 635.64 : 581.11 : 581.02
Effect of environmental factors on the transpiration and growth of tomato plants.
J. agric. Res., 1940, 61 : 697-720, bibl. 20.

Statistically treated experimental data indicate the highly significant effects of soil moisture, soil nutrients and temperature on total water transpired, on water requirements, on fruit yield and on starch content of stems and leaves of tomato.

1259. FOSTER, A. C., AND TATMAN, E. C. 635.64 : 581.02 : 632.952
Effect of certain fungicides and environmental factors on the rate of transpiration of tomato plants.
J. agric. Res., 1940, 61 : 721-35, bibl. 33.

Copper phosphate-bentonite-lime applied as a fungicide caused a significant increase in the rate of transpiration of mature tomato plants. Zinc-lime and bordeaux had no such effect. Environment did not influence the effect of the spray mixture on transpiration.

1260. HAYWARD, H. E., AND LONG, E. M. 635.64 : 631.8
Anatomical and physiological responses of the tomato to varying concentrations of sodium chloride, sodium sulphate and nutrient solutions.
Bot. Gaz., 1941, 102 : 437-62, bibl. 16.

Experiments were set up to determine (a) the character of the anatomical and physiological responses of tomato plants when grown in a series of nutrient solutions containing progressively higher concentrations of the major constituent salts and (b) the responses these plants exhibit when grown in sodium chloride and sodium sulphate solutions having osmotic concentrations equal to those of the solutions in the nutrient series. The results are summarized under 13 heads.

1261. CLINCH, P. E. M. 635.64 : 632.8
Virus diseases of tomato.
J. Dep. Agric. Éire, 1941, 38 : 24-47, bibl. 30.

A description is given of the principal virus diseases of tomato, namely, common tomato mosaic, single-virus streak, aucuba mosaic, enation mosaic, double-virus streak and spotted wilt. The relationships of the underlying viruses are indicated and their properties and mode of transmission discussed. Single-virus streak is the most common in Éire while common tomato mosaic has not yet been recognized there. However, an apparently new strain of common tomato mosaic (*Nicotiana virus* I), identified by immunity tests, causing speckling or scorching of the lower leaves and certain mild discolorations of the lower fruit trusses, is described. The name "speckling mosaic" is suggested. Control methods for the disease should aim chiefly at preventing infection and suitable recommendations are made. The appearance of single-virus streak could not be attributed directly to lack or excess of either nitrogenous or potassic fertilizers and the precise cause of the streak symptoms is undetermined. Maintenance of a somewhat hard type of growth reduced the intensity of mosaic and streak symptoms in infected crops. Applications of abnormally large quantities of sulphate of potash did not affect the fruit adversely.

1262. CHAMBERLAIN, E. E. 635.64 : 632.8
Severe-streak of tomatoes.
N.Z. J. Sci. Tech., 1940, 22 : 181A-6A, bibl. 9.

Severe-streak of tomatoes is found to be due to a combination of tobacco-mosaic and a necrotic virus. Methods of distinguishing it from ordinary streak are discussed. Control methods—hygienic—are recommended.

1263. CHAMBERLAIN, E. E. 635.64 : 632.8
Tomato-necrosis.
N.Z. J. Sci. Tech., 1940, 22 : 186A-97A, bibl. 4.

This phenomenon, tentatively named tomato-necrosis, is a component of severe-streak of tomato. Its symptoms on tomato and other hosts are described, and an account is given of trials on transmission and of its effects on plants.

1264. HARRISON, H. L., AND YOUNG, P. A. 635.64 : 632.48 : 632.651.3

Effect of root-knot nematode on tomato wilt.

Phytopathology, 1941, 31 : 749-52, bibl. 3.

The presence of the root knot nematode *Heterodera marioni* was found to reduce resistance to wilt, *Fusarium lycopersici*, in many varieties of tomato.

1265. BRIEN, R. M. 635.64 : 632.411

Foot-rot of tomatoes caused by *Phytophthora cryptogea*.

N.Z. J. Sci. Tech., 1940, 22 : 232A-6A, bibl. 10.

In New Zealand first noted in 1938. Soil sterilization by formalin or steam is suggested for control.

1266. BUTLER, L. 635.64 : 581.145.2

The inheritance of fruit size in the tomato.

Canad. J. Res., 1941, 19, Sec. C, pp. 216-24, bibl. 27.

TOMPKINS, C. M., AND TUCKER, C. M. 635.64 : 632.411

Buckeye rot of tomato in California.

J. agric. Res., 1941, 62 : 467-74, bibl. 40.

Phytophthora capsici and *P. drechsleri* are responsible.

WEBER, G. F., AND KELBERT, D. G. A. 635.64 : 632.3/4

Seasonal occurrence of tomato diseases in Florida.

Bull. Fla agric. Exp. Stat. 345, 1940, pp. 36.

1267. THIMANN, K. V., AND POUTASSE, E. F. 635.65 : 631.535 : 577.15.04

Factors affecting root formation [from isolated leaves] of *Phaseolus vulgaris*.

Plant Physiol., 1941, 16 : 585-98, bibl. 9.

The factors considered were presence of a piece of stem (advantageous) ; presence of growth substance (indoleacetic acid not exceeding 0.025 mg. per litre advantageous) ; composition of nutrient solution ; nitrogen nutrition (of great importance, adenine, particularly, resulting in increased percentage of rooting and roots formed).

1268. TOWNSEND, G. R. 635.65 : 632.3/4

Diseases of beans in Southern Florida.

Bull. Fla agric. Exp. Stat. 336, 1939, pp. 60, bibl. 26.

Snap bean diseases caused by bacteria, fungi, symptoms due to nutrient deficiencies, wind, low temperature, water, sprays, nematodes.

1269. DUNDAS, B. 635.65 : 632.421.1

Further studies on the inheritance of resistance to powdery mildew of beans.

Hilgardia, 1941, 13 : 551-65.

The paper presents the results from testing various crosses of beans (*Phaseolus vulgaris*) for resistance to powdery mildew (*Erysiphe polygoni*). It was established that resistance was due to a single dominant Mendelian factor.

1270. BABB, M. F., AND OTHERS. 635.65 : 632.112

Drought tolerance in snap beans.

J. agric. Res., 1941, 62 : 543-53.

1271. GARROW, J. D. P. 635.656 : 631.531

Pea seed production in western Canada.

Canad. Food Packer, 1941, 12 : 2 : 14-5.

The methods of growing pea seed on a large scale in western Canada are outlined. Many pests and diseases seem to find the winter temperatures in Alberta, where the industry is making great strides, inimical to their propagation. Severe seed rot in the soil was eliminated by treating the seed with mercury dust compounds and the method is recommended for trial in eastern Canada also. The treatment results in 100% stands, stands so thick that the seeding rate had to be reduced 10-20%. A brief account is given of the pure line method of stock improvement in which disease resistance, canning quality and yield are primary considerations.

1272. PIPER, C. S. 635.656 : 632.19 : 546.711

Marsh spot of peas : a manganese deficiency disease.

J. agric. Sci., 1941, 31 : 448-53, bibl. 8.

Peas grown in water solution containing no manganese showed mottling of the younger leaves and death of the growing tip and did not reach the flowering stage. The addition of insufficient manganese resulted in better but still unsatisfactory growth, while adding sufficient manganese resulted in normal growth. Marsh spot is, then, shown to be due to a partial deficiency of manganese, there being enough for normal vegetative needs, but not for healthy seed production.

1273. BAYLIS, G. T. S. 635.656 : 632.4

Fungi which cause pre-emergence injury to garden peas.

Ann. appl. Biol., 1941, 28 : 210-8, bibl. 20.

Fungous attack on garden peas in the ground before emergence was traced to species of *Pythium* and a species of *Fusarium*. Such of the isolates as developed sexual organs were referable to *P. de baryanum* and *P. ultimum*. [From author's summary.]

1274. MALTAIS, J. B. 635.656 : 632.753

The control of the pea aphid (*Illinoia pisi* Kalt.).

Canad. Food Packer, 1941, 12 : 7 : 15-6.

The life cycle of the pea aphid in Canada is briefly described. Infestation is reduced by good cultural methods tending to promote rapid and vigorous plant growth. Control is obtained by dusting with rotenone-bearing dusts and methods of doing this are discussed. Dust should be applied when the approximate average of aphids per plant is 40 or more. Frequent inspections are necessary as the plants will not show any outward signs of injury with this population.

1275. ANON. 635.655

The cultivation of the soya bean in the United Kingdom.

Bull. imp. Inst. Lond., 1941, 39 : 246-7.

This note discusses the results of experiments in the growing of soya beans in England with special reference to the paper published by Dr. H. H. Mann on his work at Woburn (*Nature*, 1941, 147 : 660-2 ; *H.A.*, 11 : 808). His results show that unsuitable climatic conditions are likely to bar any great progress until a suitable type of bean has been developed. At present (pre-war) prices even a successful crop would only represent a profit of £3 per acre.

1276. RESÜHR, B. 635.655 : 632.19

Über die Bedeutung konstitutioneller Mängel für das Auftreten von Keimlingsschäden bei *Soja hispida* Moench. (The importance of constitutional deficiencies for the occurrence of seedling loss in soya bean.)

Z. PflKrankh., 1941, 51 : 65-96, bibl. 5.

Field observations on five-week-old seedlings of the soya bean varieties, Dieckmanns Grüngelber and Dippes Giessener Schwarzer, showed that there was an average 50% loss. In Dieckmanns Grüngelber 45% of the seedlings were healthy, 6% weaklings, 10-15% of the seedlings had not come up and 35-40% of the seeds had not germinated. An analysis of the phenomena was made in the laboratory. R.M.I.

1277. LAMBERT, E. B. 635.8 : 632.411

Studies on the preparation of mushroom compost.

J. agric. Res., 1941, 62 : 415-22, bibl. 5.

A consideration of physical factors, chiefly temperature and aeration, during composting and of their influence on the subsequent growth of mushrooms. The final or "sweating out" process is proved to be all-important.

1278. MANNING, K. R., AND DeLONG, W. A. 635.1/7 : 581.192

The lignin content of some common vegetables, with observations on methods for the determination of lignin.

Sci. Agric., 1941, 22 : 69-79, bibl. 15.

RICHARDSON, A. L., AND CURRENCE, T. M. 635.31 : 581.46 : 631.55
The relation of yield of staminate and pistillate asparagus plants to the rate of growth of progenies in the young stage.
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 613-7, bibl. 2.

BREMER, H. 635.34 : 632.1/8
 Beobachtungen quantitativer Art über das Auftreten von Schäden an Gemüsepflanzen. (Schäden an Kohl). (**Observations on loss in cabbages.**)
Z. PflKrankh., 1940, 50 : 71-84.

BREMER, H., AND OTHERS. 632.1/8 : 635.31 + 635.13
 Schäden an Spargel und Möhren. (**Loss in asparagus and carrots.**)
Z. PflKrankh., 1940, 50 : 402-12.

BREMER, H., AND OTHERS. 632.1/8 : 635.656 + 635.63
 Schäden an Erbsen und Gurken. (**Loss in peas and cucumbers.**)
Z. PflKrankh., 1940, 50 : 577-95.

1279. MINISTRY OF AGRICULTURE. 633.88
Medicinal herbs and their cultivation.
Bull. Minist. Agric. Lond. 121, 1941, pp. 22, bibl. 15, 6d.

Drug manufacturers of this country have in the past relied largely on imported supplies of the medicinal herbs required for their purpose. These are now cut off and there is an urgent need for a new home-grown source of supply, notably of belladonna, digitalis, henbane and stramonium. The information given here is taken, after necessary revision, from the Ministry's *Bull.* 76. Though they are extremely interesting the cultivation details are inclined to be sketchy and one would, moreover, welcome notes on drying the harvested product. Most of the bulletin concerns cultivated herbs, but three pages are devoted to the properties and value of such wild plants as dandelion, comfrey, colchicum, etc., and two pages to oil-containing seeds, e.g. caraway, coriander, dill, etc.

1280. JAMES, W. O. 633.88
Drug plants native to Great Britain.
Nature, 1941, 148 : 217-8.

In supplying drug shortage due to war conditions the production of the following drugs is to be encouraged in Great Britain:—belladonna, foxglove, henbane, stramonium, colchicum, male fern, sphagnum, dandelion root and valerian, especially the first four. The real crux lies in the question of drying and the provision of drying facilities close to the fresh collected herbs. The use of hop kilns will help in some cases, but even there a great deal of extra shelf room will be necessary. The only method is to knock up shelves in an outhouse and fix a stove, thereby incurring an expenditure of say £10-£15, the price of dried foxglove leaf being about £10 for 2 cwt. or the produce of a ton of fresh leaves. Drying itself needs a modicum of expert knowledge and constant careful supervision of the workers. The author suggests in this a use for practical botanists.

1281. ASHBY, M. 633.88
War-time drug supplies and Empire production. Part II.
Bull. imp. Inst. Lond., 1941, 39 : 106-24, bibl. 17.

A continuation of the article *Ibidem*, 39 : 1-37; *H.A.*, 11 : 819. Notes on cultivation are followed by 5 valuable pages on harvesting and drying. For further information on drying the reader is referred to *A textbook of pharmacognosy*, by T. C. Denston (Pitman, London, 1939), *Herb gathering*, by B. Keen and J. Armstrong (Browne & Schimmer, London, 1941), and *Drying crude drugs*, being *U.S. Dep. Agric. Fmrs' Bull.* 1231, 1921. Following this, notes are given mainly on the cultivation and drying of:—*Calumba* (*Jateorhiza palmata*); caraway (*Carum carvi*); cascara (*Rhamnus purshiana*); chamomile (*Anthemis nobilis*); Colchicum (*C. autumnale*); foxglove (*Digitalis purpurea*); *Ephedra sinica*; filix-mas (*Aspidium filix-mas*); liquorice (*Glycyrrhina* spp.); *Hyoscyamus muticus*; ipecacuanha (*Cephaelis ipecacuanha*); *Lobelia inflata*; psyllium (*Plantago* spp.); Chinese rhubarb (*Rheum* spp.); santonica (*Artemisia* spp.); squill (*Urginea scilla*); and valerian (*Valeriana officinalis*).

1282. BRYCE, J. 633.2
The economic exploitation of rice grass.
Emp. J. exp. Agric., 1941, 9 : 167-70.
 The use made in Great Britain, Holland and elsewhere of the rice or cord grass (*Spartina townsendii*) in land reclamation is discussed. The Dutch have taken the lead in its practical exploitation and have found ways of establishing it in areas normally unfavourable. In Holland it is considered too valuable to graze but in England this is not so. The natural *Spartina* fields of England would provide an annual weight of 40,000 tons of dried fodder of good quality. Valuable experiments carried out in British Guiana have shown that while *Spartina townsendii* is unsuited to the climate the local *S. brasiliensis* should form a good substitute throughout the tropics. The geographical limits of *S. townsendii* are probably to be found within the regions about the 20th degree of latitude on the one hand and on the other within the 56th degree north and 52nd degree south latitude.
1283. SALMON, E. S. 633.79
Twenty-third report on the trial of new varieties of hops, 1939.
 East Malling Research Station, Kent, 1940, pp. 20, bibl. 27, 6d.
 SALMON, E. S.
Twenty-fourth report on the trial of new varieties of hops, 1940.
 East Malling Research Station, Kent, 1941, pp. 21, bibl. 3, 6d.
1284. KASSANIS, B. 633.71-2.8
Transmission of tobacco etch viruses by aphides.
Ann. appl. Biol., 1941, 28 : 238-43, bibl. 6.
 The paper gives the results of more detailed studies on the relationships between tobacco etch viruses and their vectors, chiefly *Myzus persicae*, though other aphid vectors are also named.
1285. KOCH, L. W. 633.71-2.4
Control of the blue mould disease of tobacco.
Publ. Dep. Agric. Canada 716 (Circular 171), 1941, pp. 4.
 The author discusses in turn the cause (*Peronospora tabacina*) and symptoms of blue mould disease of tobacco, proper cultural treatment for its prevention, and heat, gas (benzol and paradichlorobenzene), and spray treatment for its control.
1286. TISDALE, W. B., AND KINCAID, R. R. 633.71-2.411.4
Controlling tobacco downy mildew (blue mold) with paradichlorobenzene.
Bull. Fla agric. Exp. Stat. 342, 1939, pp. 16.
 Directions are given for the vapour treatment which has proved very successful in controlling *Peronospora tabacina*.
1287. SMITH, W. P. C., AND SHARP, A. 633.71
Field experiments with tobacco, season 1939-40.
J. Dep. Agric. W. Aust., 1941, 18 : 1-12.
 GRIBBINS, M. F., REID, J. J., AND HALEY, D. E. 633.71-1.83
The distribution of potassium in bright leaf cigarette tobacco and its influence on the quality of the leaf.
J. agric. Res., 1941, 63 : 31-9, bibl. 10.
 ESAU, K. 633.71-2.8
Inclusions in guard cells of tobacco affected with mosaic.
Hilgardia, 1941, 13 : 427-30, bibl. 10.
 ESAU, K. 633.71-2.8
Phloem anatomy of tobacco affected with curly top and mosaic.
Hilgardia, 1941, 13 : 437-90, bibl. 19.
 ANDERSON, T. F., AND STANLEY, W. M. 632.8 : 633.71
A study by means of the electron microscope of the reaction between tobacco mosaic virus and its antiserum.
J. biol. Chem., 1941, 139 : 339-44, bibl. 13.

FLOWER GROWING.

1288. SHAW, J. K. 635.976.32 : 631.541.11

Budding ornamental *Malus* on the Malling rootstocks.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 661, bibl. 3.

Ten ornamental crabs were budded on 9 Malling apple rootstocks at Amherst, Mass. All but three failed completely on Malling IX and most of them grew but poorly on the dwarfing stocks, i.e. IX, IV, III and II, in general. Budded in August 1938 most of the trees on X, XII, XIII and XVI and some of them on I and XVI grew well.

1289. UPSHALL, W. H. 635.976.32 : 631.541.11

Compatibility of Bechtel's Crab on some Malling rootstocks.

Sci. Agric., 1941, 21 : 687-8, bibl. 3.

Bechtel's Crab (*Malus ioensis* var. *plena*) proved incompatible with Jaune de Metz (Malling IX) stock. A temporary union formed but soon after and before shooting the buds began to drop out of the shield. In May the bud shields themselves began to disintegrate and they had almost disappeared by mid-June. Incompatibility with Malling II, XIII and XVI is shown in poor bud take, breaking at the union or in early colouring and dropping of the leaves. As regards Malling XII and XV, no conclusions are yet available. These results at Vineland, Ontario, agree with those reported from Massachusetts [see previous abstract] as regards IX but not as regards other Malling stocks.

1290. WATKINS, J. V., AND BLACKMON, G. H. 635.9 : 631.535

Studies with rooting media for Florida ornamentals.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 683-6, bibl. 2.

Experiments at Gainesville, Florida, show that the admixture of several organic substances with sand is likely to help in the propagation by cuttings of a number of ornamental plants which show reluctance to do so.

1291. GUNDERSEN, A. 635.976.32

Lilacs in the Brooklyn Botanic Garden including classification, cultivation, pathology.

Brooklyn bot. Gdn Rec., 1941, 30 : 191-13, bibl. 14.

FREE, M.

Cultivation and propagation of lilacs.

Brooklyn bot. Gdn Rec., 1941, 30 : 213-22.

REED, G. M.

Insect pests and fungous diseases of the lilac.

Brooklyn bot. Gdn Rec., 1941, 30 : 222-4.

Brief descriptions are given of 203 lilacs. Various methods of propagation are illustrated and described and short notes are included on pest and disease control.

1292. HUME, E. P. 635.939.98 : 612.014.44

The effect of short days upon the development of fall blooming chrysanthemums.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 665-8, bibl. 5.

At Ithaca, N.Y., at least 20 "short days" were needed before flower buds developed on any chrysanthemum cutting propagated and grown under long day conditions. The cuttings were leaf-bud and mallet cuttings taken from all parts of the stem. The terminal cuttings were always the first to show bud and were followed in this respect by the lateral buds from the upper half of the stem; these developed progressively from above downwards in accordance with their original position on the stem. Flower buds occurred on the shoots developing from these buds under long days until the midpoint of the stem was reached. No such change occurred on cuttings from the lower half of the stem. With leaf bud cuttings the flower buds developed only slightly.

1293. HURST, C. C. 635.937.34

Notes on the origin and evolution of our garden roses II*.

J. roy. hort. Soc., 1941, 66 : 242-50, 282-9.

The major groups of modern garden roses are shown to be descended from seven main species, namely *R. rubra* Blackw., *R. phoenicia* Boiss., *R. moschata* Miller, *R. canina* L., *R. chinensis* Jacq., *R. gigantea* Collett, and *R. lutea* Miller. The specific characters of these species can still be traced in their descendants. The paper contains much interesting rose history.

1294. BLODGETT, C. O., AND MEHLQUIST, G. A. L. 635.939.516 : 632.41

Snapdragon rust-resistance trials 1937-1938.

Hilgardia, 1941, 13 : 569-81, bibl. 3.

No commercial variety of snapdragon was found immune to *Puccinia antirrhini* though several were highly resistant. Although *Antirrhinum asarina*, *A. chrysothales*, *A. glandulosum*, *A. maurandoides*, *A. orontium*, *A. Ibanjexii* and *A. siculum* are highly resistant, they are thought unlikely to be of much value for breeding purposes.

1295. DOSDALL, L. 635.944 : 632.4

Botrytis crown rot of irises.

Minn. Hort., 1941, 69 : 123, 131, being *Pap. Minn. agric. Exp. Stat. misc. J. Ser.* 449.

The symptoms of *Botrytis* crown rot of garden irises is described. Three successful control dips are described any of which should be used on transplanting to uninfected ground. 1. Semesan (organic mercury compound) 0.25%. Soak the rhizomes for 30 minutes. 2. Corrosive sublimate (mercuric chloride solution 1-1,000). Soak the rhizomes for 30 minutes. 3. Calomel (mercurous chloride) 1 oz. to 1 gal. water. Dip until a heavy coating of the white suspension covers rhizomes, roots and base of leaves.

1296. DICKEY, R. D. 635.944

Paperwhite narcissus.

Bull. Fla agric. Exp. Stat. 353, 1940, pp. 24, bibl. 10.

Size of original planting was found to have a great effect on the size and number of marketable paperwhite narcissus bulbs produced, the larger sizes yielding a greater number of saleable bulbs. The desirability of the commercial growers discarding all bulb categories of 8 cm. and less is suggested. Both bulb size and category (splits or slabs, round, double nosed and mother bulbs) has a marked effect on flower production.

1297. DE MOL, W. E. 635.944 : 575.252

Das frühere Blühen bei Tulpen, ein neuer Fall einer somatischen Mutation.

(Earlier flowering in tulips : a new bud sport.)

Züchter, 1940, 12 : 88-92, bibl. 2.

From the cochineal-red Darwin tulip, Bartigon, an early variety has been produced by somatic mutation. Further experiments are needed to determine the periodicity of the new form.

R.M.I.

1298. MACARTHUR, M. 635.944

Development of the lily.

Sci. Agric., 1941, 22 : 104-7, bibl. 1.

An investigation is described of the morphology of the development of the Bermuda lily, *Lilium longiflorum*, var. *eximium* Nichols, undertaken to determine why bulbs subjected to storage before planting should give a decreased number of blossoms. Interesting data were obtained, but it was evident that the factors causing the reduction in the number of flowers must be further back in the ontogeny of the plant than the stages covered by the investigation.

1299. BRIERLEY, P. 635.944

Effect of cool storage of Easter lily bulbs on subsequent forcing performance.

J. agric. Res., 1941, 62 : 317-35, bibl. 5.

An account of trials made at Beltsville, Md., to find a storage practice which would maintain the forcing quality of the Eastern Lily (*Lilium longiflorum*) bulbs and reduce to a minimum

*Part I, *Ibidem* 66 : 73-82, H.A., 11 : 507.

the occurrence of rot, shrivelling and premature sprouting. It was found that short exposures to cool temperatures kept the bulbs in good condition and tended to accelerate blooming. The optimum treatment appeared to be storage at 50° F. for 5 weeks. Bulbs packed in moist peat moss during treatment flowered slightly in advance of those packed in dry soil or sand. Storage for 10 weeks or more at 50° F. was deleterious.

1300. THORNTON, N. C., AND IMLE, E. P. 635.944
Effect of mixtures of oxygen and carbon dioxide on the development of dormancy in Easter lilies. [Abstract.]
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 708.
- LUMSDEN, D. V., AND STUART, N. W. 635.944 : 577.15.04
Treatment [including growth substances] of Easter lily scales to expedite propagation. (Preliminary report.)
Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 707-8, bibl. 3.
- MAURI, N. 635.9 : 633.88
La thérapeutique et l'horticulture d'ornement. (The medicinal properties of certain ornamental plants.)
Rev. Hort. Agric. Afr. N., 1941, 45 : 43-6.
- HOPKINS, J. C. F. 635.939.516 : 632.4
Diseases of fruit, flowers and vegetables in Southern Rhodesia. 3. Common diseases of snapdragons.
Rhod. agric. J., 1941, 38 : 441-7, bibl. 3.
- ARTHUR, J. M., AND HARVILL, E. K. 612.014.44 : 633.88.115
Flowering in *Digitalis purpurea* initiated by low temperature and light.
Contr. Boyce Thompson Inst., 1941, 12 : 111-7, bibl. 10.
- HAMILTON, C. C. 635.939.34 : 632.654.2
Toxicity of methyl bromide to the common red spider and to greenhouse roses.
J. econ. Ent., 1941, 34 : 232-7.

CITRUS AND SUB-TROPICALS.

1301. PRINSLOO, A. L. 634.3
An economic survey of citrus growing in the Union, 1938.
Bull. Dep. Agric. S. Afr. 221 (Economic Series 30), 1941, pp. 78.
 This survey, which included 331 farms in the Union of South Africa, shows that citrus production is largely undertaken in localized centres although these exist in widely separated areas and under very different climatic conditions. The rainfall, temperature and air humidity during the blossoming period are of the greatest importance. Marketing costs in 1938 amounted to almost 50% of the gross price received. In general the capital investment in land in the citrus areas is too high and often the farms are too heavily mortgaged. In most cases the gross farm income is not enough to pay both farming costs and interest at 5%. Cost of production figures are given per morgen (2½ acres), per bearing tree, per case exported and per case yielded. There is too little organized action among citrus growers. The districts are considered separately in detail and numerous data are given in tabular form at the end.
1302. WEST INDIAN LIMES ASSOCIATION. 634.337
The British West Indian limes industry.
Trop. Agriculture, Trin., 1941, 18 : 105-6.
 A summary of the Report of an Extraordinary General Meeting and of the First General Meeting of the West Indian Limes Association.* The Association has been formed for the co-operative marketing of West Indian limes, the original subscribing members being the Limes Associations of Dominica, St. Lucia, Trinidad and Tobago, to which was added the West Indian Lime Oil Sales Company Ltd. This company handles 75% of the lime oil produced in the British West Indies and it is hoped eventually to obtain the complete co-operation of all growers. The

* To be obtained from the Agricultural Advisory Department, I.C.T.A. Trinidad, B.W.I. 3s.

importance of receiving a Government standardization of distilled lime oil was stressed. Considerable attention was paid by the meeting to the problem of disease control. A new disease of undetermined cause was reported which has destroyed almost all seedling limes in Dominica, St. Lucia and Montserrat and is attacking those in Trinidad. The investigation of rootstocks for compatibility and disease resistance was urged. Many other questions both agricultural and commercial were discussed.

1303. FRIEND, W. H., AND WOOD, J. F. 634.3

Citrus varieties for the Lower Rio Grande Valley.

Bull. Tex. agric. Exp. Stat. 601, 1941, pp. 36, bibl. 8.

Detailed descriptions are given of the fruit and peculiarities of the citrus varieties now grown in the Lower Rio Grande Valley of Texas. Among grapefruit Marsh Seedless has ousted the seeded types and has itself been superseded by the bud sports Thompson (or Marsh Pink) and such red-blushed types as Ruby. Of oranges Valencia is still the standard late variety. Hamlin a seedless variety, is very productive. Several varieties of tangelo are described. Owing to their perishable nature they are harder to market than oranges and grapefruit. Most of them resemble their mandarin more than their grapefruit parent. Mandarins also, a number of which are described, are too perishable. Limes and lemons can be grown successfully, if orchard heaters are used. Notes are also given of kumquat and limequat varieties and of the calamondin, sour orange, citron, calishu orange and Rangpur lime.

1304. FAUVEL, H. 634.323

Les variétés de grapefruits ou pomelos. (**Grapefruit varieties.**)

Rev. Hort. Agric. Afr. N., 1941, 45 : 49-54.

Modern varieties of grapefruit are described and discussed.

1305. FAHEY, H. N. 634.3 : 581.47

Crop periodicity and seedlessness in economics of Trinidad citrus.

Proc. agric. Soc. Trin. Tob., 1940, 40 : 299-301.

Seedlessness in grapefruit has now become so important that seeded varieties are practically unsaleable and much loss has been caused by planters failing to foresee this. Orange varieties with few seeds are also most in demand. The most important factor, however, ranking economically even above quality, is the ability of the grower to produce citrus fruit for the October and April, May and June markets of the U.K. At this time prices are very high and there is little competition from other lands. Ways of producing and marketing fruit in those months are suggested. It is mentioned that, if fruit is to be held on the trees, rough lemon rootstock must not be used.

1306. ANON. 634.1/8+664.85.3

Pamphlet on research projects.

Agriculture and Forestry Notes, 1940, No. 10, pp. 4 and 7-8.

Notice is given of the issue of a Chinese pamphlet of 70 pages on research projects by the College of Agriculture and Forestry, University of Nanking, Chengtu. It contains 13 projects in horticulture. They include studies on classification of Chinese fruit trees, citrus fruit selection, citrus propagation, citrus pollination and fruit set, citrus fruiting habits, handling of citrus fruits, sowing, etc., storage of citrus fruits, pruning Grimes Golden apple trees, dehydration of horticultural products, citrus fruit blossoms with a view to the production of seedless fruit.

1307. NAKAMURA, M., AND NAKAYAMA, K. 634.3 : 545.81

Analysis of the phylogenetic relationship of citrus species by colorimetric tests of bark. [Japanese. English summary 1 p.]

J. hort. Soc. Japan, 1941, 12 : 15-23, bibl. 21.

Bark samples of various kinds of citrus and citrus relatives were extracted in distilled water and the extracts were tested with modified almen reagent, molybdic acid reagent, titanous trichloride and ferric chloride. The results are found to agree very well with Tanaka's scheme of citrus classification. A comparison of the data suggests that colour reaction is somewhat conditioned by the genetic character of the plant.

1308. TURRELL, F. M., AND FISHER, P. L.

634.3 : 581.192 : 632.19

Lignin content of citrus wood.*Calif. Citrogr.*, 1941, 26 : 254, 273.

A number of uses for lignin and the possible relation between lignin production and granulation in the fruit is discussed. The lignin content of various species and varieties of healthy citrus woods on various rootstocks tested varied from 12.65% to 17.35% of the dry weight of the wood, by Phillips' method and from 12.99% to 28.82% by Ritter's method. Valencia orange scions infected with psorosis averaged a slightly lower percentage of lignin when there were bark symptoms than when none was visible. Twigs from Valencia orange scions on sour rootstock averaged 11.87% lignin.

1309. K., M.

634.3-1.541.11

Development in citrus nursery work in Georgia, U.S.S.R. [Russian.]*Soviet Subtropics*, 1940, No. 11-12, pp. 66.

A note of decisions which will result in the budding of a very large number of citrus trees on Georgian farms. This propagation work will be carried out for the first time with budwood guaranteed true to name. Unshiu and Kovana-Wase tangerines will be among the material used. It is, moreover, enacted that in future any new orange plantation is to be made only with trees worked with scions from tested stock, preferably Washington Navel, and Blood Orange (Korolek). Opportunity is to be taken to increase the acreage of Duncan grapefruit. Finally, as from the autumn of 1940, every plant leaving any nursery must previously be certified by the Regional Controller as a pure strain and free from disease.

1310. ZORIN, F. M.

634.3 : 581.145.1/2

The flowering of citrus seedlings. [Russian.]*Vernalisation*, 1940, No. 2 (29), p. 99.

At the end of February 1936 several pots containing sprouted seeds, the product of pollination of an Unshiu mandarin with pollen from a mandarin of the "pear-like shaddock" variety, were taken out and put into an unheated glasshouse where they remained in a lowered temperature for two months. Of the 37 seedlings which had been transplanted in the autumn, four flowered when they were eight months old. In 1937-8 these four seedlings did not flower; and in 1939 one of them produced two small flowers which, having failed to form fruit, dropped off. In 1938 without any treatment having been given to the seeds, two seedlings of the Duncan grapefruit produced flowers at the age of seven months. The seedlings were very small: no longer than an ordinary pencil. In 1939 they did not flower. In 1939 two seedlings, the hybrids Unshiu × an orange and Unshiu × a grapefruit, flowered at the age of three years. The plants were set out in pots and throughout the three years remained in a backward condition. All the fruits which they formed fell off. When crown-grafted, the same hybrids did not flower in 1939. A seedling of the three-year-old hybrid No. 37, Unshiu × a lemon, flowered for the first time in 1938, but the fruits which were formed dropped off. This hybrid, crown-grafted, failed to flower in 1938. In 1939, on its own roots as well as when crown-grafted, hybrid No. 37 flowered and bore fruit. Bearing in mind that crown-grafting delays the formation of shoots for one year, it is noteworthy that both the seedling on its own roots and crown-grafts made from it flowered simultaneously. Seedling No. 37 was the only one of several thousand seedlings which, under normal conditions of development, flowered and bore fruit at the age of four years. All the other seedlings referred to above only hastened their formation of flowers when subjected to a marked change of environment consisting of lowered temperature, slight drying, and keeping in pots under conditions which retarded them. Even those seedlings which flowered under comparatively normal conditions did not flower in the following years.

1311. VASILJEV, F. N.

634.3 : 581.145.1/2

Flowering of citrus seedlings at the age of 3-4 months.*Vernalisation*, 1940, No. 6 (33), pp. 114-5.

From November 1938 to May 1940, seeds of lemons, oranges and citrons, taken from spoiled fruit, were kept in a refrigerator at a temperature of 2° C. to 4° C. On 4 May a mixed quantity of these seeds was sown, still in a moist condition, in a cold frame in a specially prepared soil at

a depth of 3 cm. On 8 June the seedlings, numbering 139 in all, germinated. On 6 September, four months later, one seedling had completed and another was about to complete flowering; and the flowers on each were normal in form. On 9 September the bud of another seedling opened and on the same day it was artificially pollinated with lemon pollen. Next day this pollination was repeated. The dimension of the flower was then almost normal, the stigma was exuding moisture, and a strong aroma of lemon was being given off. The flowering of this plant was completed by 13 September; its fruit was well formed and thereafter developed slowly. The flowers of the two seedlings first mentioned were not artificially pollinated and they withered and dropped off. On 6 September a little bud appeared on another seedling. In structure it was different from the buds of the other seedlings mentioned. It was shorter and rounder, somewhat of the orange or citron type, whereas they were longer and rather of the lemon type. On 2 October small buds formed on three more seedlings. When the cold weather set in, some seedlings were transplanted into pots which were placed in glasshouses, and 66 seedlings were left through the winter in the ground with slight heating. Experiments were then undertaken with a view to ascertaining the causes of the early flowering of plants, which under usual conditions would not flower until they had reached the ages of 6, 8 or even 15 years. Seeds were sown with the pericarp, and seeds which had been kept in fruits of different species and varieties for various periods and at various temperatures. One method applied was the sowing of seeds of citrons germinating inside the fruit over a lengthy period (10 months) and kept in a refrigerator at a temperature of 2° C. to 4° C. Another method tried was the sowing of seeds germinated in fruit formed on a lemon tree in a glasshouse; it remained on the tree until October 1940 when the upper part near the stalk decayed and dropped off. All the seeds in the fruit sprouted. Some of them formed not only roots but green shoots, extending beyond the cotyledons. They were cut out of the fruit, together with part of the pericarp, and planted out in a glasshouse.

1312. SINGH, S. 634.31-1.542
Ringling and root pruning of non-bearing sangtra trees in the Punjab.
Punjab Fruit J., 1940, 4: 808-10.

An experiment is described in which a number of comparatively unfruitful sangtra orange trees at Montgomery, Punjab, were treated by ringing or by root-pruning 6 weeks before flowering. In the ringing experiment a complete ring of bark 0.5 cm. in width was removed from the trunk without injuring the wood. The wounds were covered with waxed tape to encourage healing. Root-pruning was accomplished by digging out the fibrous and small roots to a depth of 9 inches from a circular strip round the tree 3 feet wide and 1 foot from the trunk. The holes were left open for 10 days before filling with a mixture of earth and yard manure. Root-pruning had no effect but ringing in 1938 and 1939 resulted in yields which were 3 or 4 times greater than those obtained on the controls.

1313. McCOLLAM, M. E. 634.3-1.83
Potash and citrus crops.
Calif. Citrogr., 1941, 26: 253, 266.

Argument still continues as to the benefit, if any, of applying potash to Californian citrus soils, soils which show a wide range of differences. The author (of the American Potash Institute) discussing the question, supplies data showing that potash has in many cases improved yield, increased juice content and given fruit with a thinner rind.

1314. OBERHOLZER, P. C. J. 634.3-2.19: 546.46
Suspected magnesium deficiency in citrus.
Fmg S. Afr., 1941, 16: 235-6.

A chlorosis of citrus trees occurring in western and eastern Transvaal is under investigation. The characteristic symptoms of the mature leaves are a fading of the chlorophyll along the central part of the midrib resulting in a gradual yellowing of the leaf. The tendency is confined largely to the basal part. In grapefruit the wings of the petiole usually remain green after the rest of the leaf has turned yellow. The symptoms closely resemble those of magnesium deficiency as found in Florida and Australia.

1315. PEECH, M. 634.3-1.4
Chemical studies on soils from Florida citrus groves.
Bull. Fla agric. Exp. Stat. 340, 1939, pp. 50, bibl. 53.
 Data based on some 100 groves are considered.

1316. KALICHAVA, A. D. 634.334-2.111
Training lemons along the ground in the Zugdidsk branch of the VNIICHSK.
 [Russian.]
Soviet Subtropics, 1940, No. 11-12, pp. 25-9.

Using both normally trained lemon trees and trees planted at an angle of 45°, various methods of frost protection were tried, namely mounding up with earth on the north and south sides of the creeping branches, covering with matting and with tents covered with grass, gauze and/or snow. Results indicate that if the lemons, however trained or otherwise protected, are further protected with a good depth of snow they are likely to survive at least -10° C. without much damage. If there is insufficient snow they are likely to suffer badly. [The creeping form is obviously more liable to be adequately covered.—Ed.]

1317. GULUA, A. 634.3-2.111
The overwintering of citrus trees in the regional stations of the VNIICHSK.
 [Russian.]
Soviet Subtropics, 1940, No. 11-12, pp. 23-4.

Observations on frost resistance of different citrus forms in Abkhasia and other districts at the foot of the Caucasus indicate that there are considerable possibilities for the development of citrus growing there. Duncan grapefruit showed about the same frost resistance as the Turkish orange. The Silver Khili tangerine proved more cold-resistant than Unshiu and than Washington Navel. The various lemons were all about equally frost-resistant. At temperatures down to -7.8° C. [about 18° F.] 3 layers of gauze appeared to guarantee the safety of lemons. The limequat proved less cold-resistant than the lemon variety New Georgia.

1318. CITRUS EXPERIMENT STATION, LAKE ALFRED. 634.3-2.111
Care of citrus groves injured by cold.
Pr. Bull. Fla agric. Exp. Stat. 546, 1940, pp. 2.

Delay pruning till extent of damage can be seen. Delay fertilizer application till all danger of frost has gone, then use material containing quickly available nutrients. Nutritional sprays can be recommended once new growth has developed. Irrigation may be useful in the absence of further cold. Pests will be as numerous as before.

1319. BEACHAM, L. M. 634.31-2.111 : 581.192
Studies on Florida and California oranges in regard to the relationship of frost damage to juice content.
J. Ass. off. agric. Chem., Wash., 1941, 24 : 788-93.

Oranges injured on the tree by freezing are characterized by drying out of the flesh which continues progressively, sometimes for several months. Any such drying is accompanied by a decidedly lowered juice content. The results of trials in Florida in 1940 with mid-season oranges and Valencias and in California in 1941 with Valencias show that a comparison of the juice content of sound fruit in a given lot of oranges with that of all the fruit present in that lot may be used for determining objectively the extent to which the lot has been injured by freezing.

1320. RHOADS, A. S. 634.3-2.8
Nature and cause of psorosis of citrus trees.
Pr. Bull. Fla agric. Exp. Stat. 540, 1939, pp. 2.
 A virus.

1321. FAWCETT, G. L. 634.3-2.4
La verrucosis de los citricos. (Citrus scab.)
Rev. industr. agric. Tucuman, 1940, 30 : 227-8, being *Circ. Estac. exp. agric. Tucuman* 94.

Scab (*Sphaceloma* spp.) is commonly found attacking the fruit of sweet oranges of various types in Tucuman while another form attacks lemons and sour orange. The leaves are also sometimes

affected. Control measures are recommended. (1) Spray with a $\frac{3}{4}\%$ bordeaux mixture shortly before flowering, (2) spray again with $\frac{1}{2}\%$ mixture when the majority of the flowers have fallen. A third spray may be given later but is usually uneconomic.

1322. RUEHLE, G. D., AND THOMPSON, W. L. 634.3-2.482

Commercial control of citrus scab in Florida.

Bull. Fla agric. Exp. Stat. 337, 1939, pp. 47, bibl. 14.

RHOADS, A. S., RUEHLE, G. D., AND THOMPSON, W. L.

The cause and control of citrus scab.

Pr. Bull. Fla agric. Exp. Stat. 554, 1940, pp. 4.

Six years' field trials in grapefruit, tangelo and King orange groves have enabled the authors to make recommendations for the control of scab (*Sphaceloma fawcetti*) in Florida. They consider that home-made bordeaux made from pulverized copper sulphate and superfine hydrated lime will give consistently good control. Where the overwintered foliage is badly infected a 6-6-100 formula is recommended for the pre-growth spray given just before the spring flush of growth. For bloom and post-bloom sprays the 3-3-100 formula has sufficed, provided a pre-growth spray has already been given. If the overwintered foliage is only slightly infected a single pre-growth 6-6-100 spray should suffice. To prevent scale an oil emulsion at 1% concentration of oil or wettable sulphur at 5-10 lb. per 100 gallons should be combined with the pre-growth copper spray. The use of other sprays is also discussed.

1323. RUEHLE, G. D., AND KUNTZ, W. A. 634.3-2.42

Melanose of citrus and its commercial control.

Bull. Fla agric. Exp. Stat. 349, 1940, pp. 54, bibl. 35.

Studies were started in 1931 at the Citrus Experiment Station at Lake Alfred on melanose of citrus caused by *Diaporthe citri* or its Imperfect form *Phomopsis citri*. These experiments, which concerned the incidence and control of the fungus, are briefly described. Perfect control by spraying would be uneconomic and conducive to excessive scale incidence. Hence a practical control programme should be one which must fall somewhat short of completeness, but does not make the subsequent control of insects excessive. Pruning is a necessary adjunct to the spray programme. A sliding spray schedule is drawn up to suit varying conditions of infection by scab and infestation by scale insects in grapefruit, orange and tangelo groves, which should afford reasonable control of melanose.

1324. BAL SINGH BAJWA. 634.3-2.4

Gummosis in fruit trees.

Punjab Fruit J., 1941, 5 : 889-91.

A brief account is given of gummosis of citrus and other fruit trees prevalent in the Punjab and of the factors favouring infection. Methods of prevention suggested are planting on the well-drained lighter loams, avoidance of deep planting and bark injury, especially by hoeing, and the use of the more resistant stocks, e.g. sour orange and rough lemon. For plums on heavier soils plum stock is to be preferred to peach. Treatment for affected trees consists in cutting out the affected portion and painting with bordeaux paste, to be followed as soon as healing starts by a covering of asphalt paint. Instructions for making bordeaux paste are given.

1325. BLACKFORD, F. W. 634.3-2.952.

The establishment of a home-made cuprous oxide mixture as a citrus fungicide in Southern Queensland.

Qd agric. J., 1941, 54 : 4-33, bibl. 32.

The investigations were carried out to find an alternative spray for citrus to bordeaux mixture, the latter having certain disadvantages which make orchardists disinclined to use it. A cuprous oxide mixture prepared from copper sulphate, molasses and caustic soda was studied and compared with bordeaux. No difference could be found in fungicidal efficiency in the control of black spot, brown spot and melanose. Scab was also controlled by it. Its compatibility with various sprays was examined. By modifying the original formula the mixture could be added to sprays containing soap and/or white oil without impairing the efficiency of either mixture. Cuprous oxide-sprayed trees can be fumigated with HCN sooner than bordeaux-sprayed trees.

On the basis of these experiments comprehensive spray schedules are given for the control of citrus diseases and pests in southern Queensland.

1326. MORRIS, H. I., KLOTZ, L. J., AND SOKOLOFF, V. P. 634.3-2.42

Brown rot control and copper injury.

Calif. Citrogr., 1941, 26: 284, bibl. 2.

An interesting case of lemon fruit burn by bordeaux mixture used as a spray for brown rot is discussed. The injuries to the rind surface of the lemon were associated with the high copper content of the necrotic tissue resulting presumably from the copper sprays. A dilute formula 1-1-100 gave satisfactory commercial control of brown rot and injury was reduced to very minute stipples, detectable with a hand lens, by the addition of 5 lb. of zinc sulphate to the formula. The zinc also decreased the tendency of trees to be injured by the combination effects of copper and fumigation. The source of the injury was the accumulation in raindrops and moist plant surfaces of CO₂ as carbonic acid, thus favouring the solution of copper to concentrations which corrode the surface cells of the fruit.

1327. FENNAH, R. G. 634.3-2.7

Citrus pests investigation. Report on a visit to Jamaica in November, 1940.

J. Jamaica agric. Soc., 1941, 45: 115-23.

This report deals chiefly with the damage to citrus in Jamaica by the fiddler beetles, *Prepodes* spp. Damage is caused by the removal of strips of bark by the beetles as they feed progressively along the roots, often girdling large roots within a radius of 2 feet from the trunk. Unless already lacking in vigour, trees attacked lower down the root system are less seriously inconvenienced. Hence the remedy suggested and successfully tested elsewhere is to remove the soil from the crown and main roots in small trees to below the edge of the canopy and in larger ones to 2 feet from the trunk. A basin is thus formed beneath the main roots. For effectiveness the roots must be bared beyond a point at which they fork into 2 or more branches so that larval attack is not concentrated on the few larger roots. Common errors in applying this treatment are delay in initiating it and insufficient baring. The latter fault arises from the erroneous supposition that the tree will fall over or suffer injury. Excavation under the root is done with a pointed stick of *Gliricidia* or other brittle wood which will break if used roughly. Directions are given for planting young trees on mounds up to 3 feet high if possible. The mounds sink and in two years the large roots are exposed where they join the trunk. A second method is to destroy the newly hatched weevil larvae as they enter the soil from the egg mass in the canopy above. Lead arsenate at the rate of 1 lb. to 100 sq. feet is applied to clean-weeded soil below the canopy or 1 lb. to a circle of 6 feet radius from the trunk in March or early April. A rough and ready test to decide whether a sickly tree has sufficient recuperative powers to warrant its retention is suggested. A small circle of bark is removed with a narrow-bored cork borer from the sickly and from neighbouring healthy trees. If the wound on the sickly tree takes much longer to callus than its healthy neighbours it is not worth keeping. The need for getting a stock with a lateral rather than a downward root spread for adequate control of the beetle is stressed, and it is remarked that soil type, for reasons unknown, has in Jamaica a great influence on root direction. Other causes of ill health of citrus such as incompatibility, waterlogging, drought and gummosis are also considered.

1328. THOMPSON, W. L. 634.33-2.653/4

Control of the citron plant bug on citrus.

Pr. Bull. Fla agric. Exp. Stat. 555, 1940, pp. 2.

Leptoglossus gonagra, the citron plant bug, in Florida breeds in partially decayed citron melons (*Citrullus vulgaris*) and the adults migrate thence to tangerines and oranges. The bugs tend to gather in groups on the fruit, with a preference for tangerines. The control recommended is collection of bugs by shaking in the cool of the morning when they are sluggish and netting and destruction of adults and nymphs on infested melons.

1329. PERSING, C. O., AND BEIER, R. L. 634.3-2.73

Citrus thrips control.

Calif. Citrogr., 1941, 26: 319, 350.

Problems connected with the use of tartar emetic in citrus thrips control at the Riverside Citrus Experiment Station receiving special attention this year were (1) timing of spring and summer

applications on oranges, (2) optimum doses of tartar emetic and sugar on oranges and lemons, (3) evaluation of substitute materials. Treatment at petal fall was effective in preventing the scarring of oranges and in late July and early August for the protection of new growth. The dosage recommended is 1½-2 lb. tartar emetic per acre for orange and 3-4 lb. per acre for lemon. The amount of sugar should be equal in weight to that of the tartar emetic. Potassium antimony citrate, which can be produced from domestic raw materials, has been closely investigated as a possible substitute in the event of a shortage of tartar emetic through war conditions. It is less effective, but by adjusting the pH of the sprays containing the compound to about 6.0 efficiency was increased to nearly that of tartar emetic in greenhouse thrips control. In the field, however, there was no increase in efficiency, though this spray is, nevertheless, considered reasonably effective for oranges. Its efficiency was not increased by (1) higher concentrations of sucrose, (2) the addition of glucose, brown sugar or molasses, (3) various pH levels adjusted with potassium hydroxide, sodium hydroxide and sodium bicarbonate in various waters of different degrees of hardness.

1330. ENGLISH, L. L., AND TURNIPSEED, G. F. 634.3-2.752

The influence of temperature and season on the citrus red mite (*Paratetranychus citri*).

J. agric. Res., 1941, 62 : 65-77, bibl. 6.

Observations from Alabama are recorded and plotted on the effect of season and temperature on the incidence of citrus red mite. Several phases of its life history, i.e. length of incubation period, time of development from egg to adult and time of development from egg to egg, were found to be mathematically related to the average temperature. The population of the red mite is found to decline in hot weather—average temperature up to 80° F.—and increase in cool weather—average temperature down to 50° F.—the early spring months in Alabama affording optimum conditions.

1331. LINDGREN, D. L., AND SINCLAIR, W. B. 634.3-2.944

The ridging of citrus fruits as influenced by fumigation of citrus trees with HCN.

J. econ. Ent., 1941, 34 : 477.

Recent observations on oranges, grapefruits and lemons show that ridging may develop on the fruit of citrus trees fumigated with HCN when the fruit is in the bud stage of development.

1332. DICKSON, R. C. 634.3-2.752

Inheritance of resistance to hydrocyanic acid fumigation in the California red scale.

Hilgardia, 1941, 13 : 515-22, bibl. 9.

Resistance to HCN fumigation in the Californian red scale, *Aonidiella aurantii*, depends on a single gene (or group of closely linked genes) in the X-chromosome and is therefore sex-linked. Crosses between the resistant and non-resistant strains resulted in the F₁ females proving intermediate in percentage survival after fumigation between the two parental strains. The F₂ females were intermediate in percentage survival between F₁ females and that strain to which their paternal grandmothers had belonged. Owing to the gradual elimination of the non-resistant strains by continued fumigation the red scale will gradually become generally resistant to such control until practically all the population is of pure resistant strain. Once this condition is reached there should be no appreciable increase in resistance. [From author's summary.]

1333. LINDGREN, D. L. 634.3-2.752

Factors influencing the results of fumigation of the California red scale.

Hilgardia, 1941, 13 : 491-511, bibl. 16.

A series of experiments was conducted by the Riverside Citrus Experiment Station to determine the relative value of 15-, 30- and 45-minute exposures in the fumigation of red scale, *Aonidiella aurantii*, with hydrocyanic gas. Eight-unit form tents were used and the insects were on grapefruits hung in baskets as near the centre of the tent as possible; the temperature was 75° F.; the time just after sunset. High mortality of non-resistant red scale and unsatisfactory results with resistant red scale were obtained with low dosages and short exposures. When

preconditioned by cooling at 50° F. 3-4 hours before fumigation, both types showed a higher percentage of kill than when preconditioned at 75° or at 90° F. Preconditioning resistant scales at 50° F. did not overcome the protective stupefaction set up by prefumigation with sub-lethal doses. In both types the motile young are least resistant to HCN while the early grey adults of the non-resistant type and scales in the 2nd moult of the resistant type are most resistant. Scales of both types passing from early grey to late grey adult stage become more susceptible.

1334. LINDGREN, D. L. 634.3-2.752-2.944
Fumigation investigations.

Calif. Citrogr., 1941, 26 : 283, 312-3, 316.

The subjects discussed are scale survival on the outside of the tree, double fumigation, post-humous birth or the emergence of young scale after the mother scale has been killed by fumigation (improbable), relative susceptibility of red scale on different citrus host varieties, fumigation injury, fumigation of large walnut trees, progress of the survey of resistant red scale distribution.

1335. MCBETH, I. G., AND ALLISON, J. R. 634.3-2.752
Rotenone and oil sprays.

Calif. Citrogr., 1941, 26 : 282, 310-1.

Some observations on the use of toxic materials in the control of scale pests of citrus.

1336. SINCLAIR, W. B., BARTHOLEMEW, E. T., AND EBELING, W. 634.3 : 581.192 : 632.944
Composition of the juice of orange fruits from oil-sprayed and HCN fumigated trees.

Calif. Citrogr., 1941, 26 : 322, 346-7, 348.

The spraying of citrus trees with light-medium oils in concentrations of $\frac{1}{4}$ -1 $\frac{3}{4}$ % caused a reduction in the total soluble solids and in reducing and total figures of the fruit juice. There was only a small reduction in titratable acidity, insufficient to produce an effective change in pH of the mature fruit. Differences between the composition of fruit sprayed with $\frac{3}{4}$ % and 1 $\frac{3}{4}$ % oil were only slight, since apparently the physiological effects produced by the lower percentages were of such intensity that a 1 $\frac{3}{4}$ % oil spray failed to cause further changes in the chemical composition of the fruit. Wide differences in locality and soil type had no influence on the changes produced. No marked effect on the chemical composition of the fruit was caused by fumigation with HCN.

1337. WATKINS, J. V. 635.9 : 631.53
Propagation of ornamental plants.

Bull. Fla agric. Exp. Stat. 347, 1940, pp. 54.

A useful bulletin of detailed instruction in methods of propagation of such tropical and sub-tropical plants as are grown in Florida. The use of growth substances is regarded favourably provided none of the usual care given to untreated cuttings is omitted.

1338. KHAN, M. A. 634.451
Japanese fruit or persimmon (*Diospyros kaki*).

Punjab Fruit J., 1940, 4 : 846-7.

Notes on growing the Japanese persimmon in the Punjab. The principal points are as follows. Propagation by budding, grafting, layering or cuttings; planting time, January or early February; spacing 18-20 ft., the tap root may be slightly shortened when planting; plants when first set out are headed back to 18 inches and later thinned out to 3 or 4 well-placed branches, the ultimate shape aimed at is described as globose; harvest in October-November when the fruit is yellow but still hard; keep wrapped in paper in a warm room until it is as soft as jelly, when it loses its astringency and becomes eatable; birds attack the fruit readily; shelter of its own foliage or shade trees are necessary for the fruit in the moist heat of the rainy season in the plains: the colder districts are the most suitable for full production.

1339. RZHEVKIN, A. A. 634.63-1.535
The vegetative reproduction of the olive. [Russian.]

Soviet Subtropics, 1940, No. 11-12, pp. 37-9.

Common methods of propagating the olive by cuttings of older wood and by ovuli or burls are described. The objection to them is that they cannot be used on a large scale without

damaging the parent tree, whereas olive plants are in heavy demand in Russia both by the research stations and farmers. Experiments have therefore been carried out at the Nikita Gardens with one-year-old green and half-ripened shoots with and without the use of growth substances. Various lengths of cutting and times of planting were tried. The best results were obtained with cuttings 8-12 cm. in length taken in autumn and winter, and set in sand in a heated greenhouse. Although not particularly high the percentages rooting (maximum 36%) were considered satisfactory. The growth substances seem to have increased the number rooting by 3 or 4% and varietal differences also appeared to have had some influence.

1340. PODLUZHNI, D. F.

634.63-1.535

Propagation of the olive tree by cuttings. [Russian.]

Soviet Subtropics, 1940, No. 11-12, pp. 41-3.

The experiments in the propagation of olives by greenwood cuttings recorded here from the experiment station at Azerbaijan obtained a higher percentage of success (from 53 to 77%) according to variety, than those recorded in the previous abstract. The conditions for success were a well-aerated, well-watered sand as rooting medium and a saturated atmosphere. The cuttings of year-old shoots 4-6 mm. thick were planted in boxes in separate batches according to whether the cutting was from the upper, middle or lower sections of the shoot. Each section was 6-8 cm. in length. A saturated atmosphere was maintained by covering the boxes with a glass pane. A small-grained sand proved a better rooting medium than a coarse-grained one. The air temperature in the houses ranged from 16.9° C. in November to 23.8° C. in February, the sand temperatures in the boxes being always somewhat lower. Cuttings from the lower third of the shoots rooted by far the best, those from the middle next and those from the terminal section scarcely at all. The most successful month for taking the cuttings was October.

1341. DE ALMEIDA, F. J.

634.63-1.55

Safra e contra-safra na oliveira. (Biennial bearing in the olive.)

Investigação Minist. Agric., Lisbon, 7, 1940, pp. 154, bibl. 130.

A very complete study of the possible causes of biennial bearing in the olive is presented. The process of fruit formation is closely observed from initiation of the flower bud to maturity of the fruit. Various phenomena likely to interfere with cropping are surveyed, namely, floral deficiency, abscission of flowers and fruit, the imperfect development of the fruit (a condition known as "measles"), physiological, climatic, pathological and cultural causes. Certain recommendations are made, namely, the abandonment of all cultural practices shown to be detrimental, the conservation of soil moisture by adequate technical methods, a moderate pruning after an off year, a manurial application following an on year, early harvesting.

1342. DICKEY, R. D., AND REUTHER, W.

633.85

Flowering, fruiting, yield and growth habits of tung trees.

Bull. Fla agric. Exp. Stat. 343, 1940, pp. 28, bibl. 9.

Observations on the 10 original tung trees planted in the grounds of the Gainesville station and of some of their progeny show no particular correlation between the ability of a tree to yield heavily and tree size, conformation and volume of bloom produced. Fruiting habit as distinguished by the single and cluster type is the best index so far available of the ability of a tree to fruit heavily. Out of 34 highest yielding trees in a block observed 24 were of the cluster and 10 of the single type, while of the 34 lowest yielding trees 23 were of the single and 11 of the cluster type. There are indications that in selecting seed for planting choice should be made from trees showing the highest yields, especially when this is coupled with the cluster fruiting habit. Observations indicate that the height of branching of nursery seedlings and its subsequent effect on height of head is a definite genetical character.

1343. CHURSOFF, N.

633.85-1.536

Transplanting adult tung trees. [Russian.]

Soviet Subtropics, 1940, No. 11-12, p. 64.

In this extract from a pamphlet of the VNIICHSK the successful transplanting of 5-year-old tung trees is very briefly described. The plants were drastically pruned, and the pruning wounds painted with ochre before replanting. The replants grew very well.

1344. TARAN, E. N. 633.85 : 575.127.2 : 581.6
Oil extracted from the first fruits of the hybrid *Aleurites fordii* × *Aleurites cordata*.

Proc. Lenin Acad. agric. Sci. Moscow, 1941, No. 7, pp. 34-6.

Although *A. fordii* is superior in yield and quality of oil, its earlier flowering and maturity make it more difficult to grow in the Soviet Subtropics. Some of the interspecific hybrids made in 1933-34 bore fruit for the first time in 1939. Their seeds contained 8.67% water, 2.95% salt and 54.68% oil, the oil content by dry weight amounting to 59.87%; this is lower than the majority of plants of *A. fordii*, which contain over 60%. Finely ground seeds were triturated with petroleum ether and the oil isolated; the oil resembled ordinary tung oil in odour and consistency and in composition fulfilled the requirements of the American standard (A.S.T.M.St.). Its iodine number was 164.64, that of *A. fordii* varying in different individuals from 157.86 to 169.87 and that of *A. cordata* from 145.59 to 147.89 in the female trees and 153.18 to 155.18 in the monoecious. The time required for gelatinization of the oil at 282° was 15.5 minutes, as against 9 minutes for *A. fordii* and 48 minutes for *A. cordata*. The product of gelatinization was somewhat less dense than that from *A. fordii*.

1345. NAVARRO DE ANDRADA, E. 633.88.11.871
The eucalyptus in Brazil.
J. Hered., 1941, 32 : 215-20, 240.

The author gives a brief account of the introduction of this tree into Brazil and of its immense success there. It has proved an admirable source of fuel for locomotives, of paper pulp, of foundation piles, of poles for telegraph wires, fences, etc. It has proved to be the only tree yielding first quality wood that grows so quickly as to be utilized by its planter.

1346. ZELENSKAYA, N. I. 633.956-1.531.16
Effect of length of storage on the germination and viability of *Ocimum canum* seeds.

Proc. Lenin Acad. agric. Sci. Moscow, 1941, No. 5, pp. 22-3.

Three years' experiments with camphor basil seed, with and without husks, kept in a ventilated iron box at a temperature varying from 53.6 to 62.6° F. showed that germination capacity fell rapidly each year, being reduced to nil in the 4th or 5th year. The seeds left in their husks showed a 27% higher germination capacity in the third year than the husked seed.

1347. CESAR, H. P. 634.451
Instruções práticas sobre a cultura do caquizeiro. (Cultivation of *Diospyros kaki*.)

Rev. Agric., S. Paulo, 1941, 16 : 161-81.

A very careful account of the cultivation of *Diospyros kaki*, the Japanese persimmon, in which special attention is paid to methods of propagation by nursery and bench grafting, and budding. Preparation of stocks and all other cultural operations are described.

1348. WOLFE, H. S., AND LYNCH, S. J. 634.651
Papaya culture in Florida.

Bull. Fla agric. Exp. Stat. 350, 1940, pp. 35, bibl. 32.

A comprehensive bulletin giving an account of the flower structure and pollination of the papaw (*Carica papaya*), of its soil preferences and of its cultivation in Florida. Propagation is by seed and the use of so-called community pots, i.e. bottomless cups made of asphalt felt paper, is advocated. The papaw responds well to fertilizers. It should be kept in active growth and this can be done by using a heavy mulch of grass, peat moss or other material to conserve moisture and protect from overheating. Where fruit forms in clusters it is generally profitable to thin to two per node. Notes are given on picking for transport or for local market. Cold storage has not proved uniformly successful. A normal yield in a commercial planting during a bearing life of 12 to 18 months is 20-40 fruits or 75-150 lb. per tree. The grower should select with a view to the production of small compact size fruit with high quality flavour for the fresh fruit market or of large size and crop for the processing market. Three diseases and five pests are noted with suggestions for their control.

1349. HURWITZ, S. 633.2/3+631.874
New field crops for Palestine. I. Forage, pasturage and green manure.
Bull. Rehovoth agric. Res. Stat. 26, 1940, pp. 116.

Among crops being tested in Palestine particularly for their use as green manures are *Sesbania*, *Crotalaria*, *Cajanus indicus*, *Centrosema*, *Agati*, *Tephrosia*, Soya bean, *Canavalia ensiformis* and *Phaseolus mungo*. Results obtained with the first two were good and are recorded in some detail. The best results with *Sesbania macrocarpa* were obtained on heavy permeable (calcareous) soils. *S. macrocarpa grandiflora* and *S. macrocarpa aegyptiaca* proved more suitable as windbreaks than as green manure. Of *Crotalaria*, *C. juncea*, *C. anagyroides* and *C. usaramoensis* were tried. The two last were too woody. *Crotalaria* thrive on light soils even on such light soils as failed to support *Sesbania*. Details of growth made are given in each case and of chemical composition in *Sesbania*.

1350. ROGERS, L. H., AND OTHERS. 631.416
Distribution of macro and micro elements in some soils of peninsular Florida.
Bull. Fla agric. Exp. Stat. 341, 1939, pp. 31, bibl. 21.

Chemical and spectrographic analyses for 7 macro and 27 micro elements as also pH loss on ignition and insoluble matter are recorded for 89 cultivated and 43 virgin soils in central Florida.

TROPICAL CROPS.

1351. HILL, A. W. 633/634
The search for economic plants.
Nature, 1941, 148 : 15-6, 42-4.

Interesting historical notes on the origin and distribution of a large number of economic plants including pepper (*Piper nigrum*), clove (*Eugenia caryophyllata*), cinnamon (*Cinnamomum zeylanicum*), nutmeg (*Myristica moschata*), coconut (*Cocos nucifera*), groundnut (*Arachis hypogaea*), oil palm (*Elaeis guineensis*), cassava (*Manihot utilisissima*), cashew (*Anacardium occidentale*), cinchona (*Cinchona* spp.), rubber (*Hevea brasiliensis*), cacao (*Theobroma cacao*), sisal (*Agave sisalana*).

1352. HUITEMA, W. K. 633 : 551.566.1
Het landbouwkundig onderzoek bij overjarige cultures, in het bijzonder bij eenige nieuwe handelsgewassen. (Agricultural research on some of the more recently introduced commercial perennial crops.)
Bergcultures, 1941, 15 : 818-25.

Much work has been done in the Dutch East Indies on the trial and selection of subsidiary crops, e.g. derris, pyrethrum, tung, and many other oil bearing plants, cloves, *Cananga*, geranium, dye-producing plants such as *Bixa orellana*, drugs, etc. Some account of the results are given here.

1353. JACK, H. W. 371.2/3 : 63
Agricultural education of Fijians.
Agric. J. Fiji, 1941, 12 : 32-5.

An account is given of the system of agricultural education available to Fijians. Some 57 students are undergoing a 2-year course at the Experiment Stations of the Department of Agriculture, the syllabus being intensely practical. Four provinces also maintain small training farms for selected pupils, there being 70 in residence at the time of writing. There are also six sub-stations which demonstrate farm practices within the scope of the peasant. These are much visited by the Fijians. There are in addition 4 Fijian settlement schemes comprising 92 peasant farmers supervised by the Department of Agriculture. Agricultural instruction is given in schools and missions while the Colonial Sugar Refining Company maintains 80 students on its training farm.

1354. HYNAM, C. A. S. 63 : 551.566.1
Agriculture in the Dutch Windward Islands.
Trop. Agriculturist, 1941, 18 : 135-8, bibl. 2.

An account of the condition and prospects of agriculture in the small Dutch West Indian islands of St. Maarten, Saba and St. Eustatius.

1355. RODRIGO, P. A., AND TECSON, A. L. 635.1/7: 631.531.16

Storing some vegetable seeds.

Philipp. J. Agric., 1940, 11: 383-95, bibl. 10.

Viability of vegetable seeds in storage, though dependent on variety, was greatly influenced by the method employed. Seeds in air-tight vials remained viable about 190 to 720% longer than seeds in corked but unsealed receptacles. The rapid loss in the unsealed containers was due to the absorption of moisture which must have started some degree of metabolism. In a greater or less degree seeds kept in sealed vials manifested a striking renewal of vigour in their viability without any change of treatment after they had passed through a period when viability was much weakened. The author quoting an earlier paper of his* remarks that "this renewed life activity after a period of semi-dormancy . . . is a natural phenomenon manifested in many other ways in the life of both plants and animals". He also recently observed that 13-year-old mungo (*Phaseolus aureus*) seeds produced more beans than 1-month-old seed.

1356. TAYLOR, E. M., AND MEHTA, M. L. 631.67

Some irrigation problems in the Punjab.

Indian J. agric. Sci., 1941, 11: 137-69, bibl. 23.

The problems of irrigation in the Punjab are discussed under the following heads—Construction and maintenance of canal systems; rise of the water-table and waterlogging; deterioration of land due to the accumulation of sodium salts; tube-wells; distribution of irrigation water—method of assessment; rainfall, run-off and soil erosion; administration.

1357. ANON. 631.875

A method of compost making used in Nyasaland.

E. Afr. agric. J., 1941, 7: 45-7.

The description is taken from a circular issued by the Department of Agriculture, Nyasaland, and concerns the method of composting used at the Zomba Experimental Station. The object of the process is to convert a mixture of plant residues and animal waste products into a type of organic matter similar to that found in well-aerated soils and to effect this with a minimum loss of nitrogen. Costs at Zomba are under 3s. per ton.

1358. CULTUURTECHNISCH INSTITUUT. 632.951

Cultuuraanwijzingen voor pyrethrum. (Cultivation of pyrethrum.)

Landbouw, 1941, 17: 255-7.

Pyrethrum, at present an experimental crop, grows well in Java at a minimum altitude of about 5,000 ft. Propagation is usually from seed. The paper chiefly deals with propagation and with cultural and preparation methods in countries where the crop is well established.

1359. DRIESSEN, F. C. 631.874

De betekenis van de groenbemesting voor de overjarige cultures. (The importance of green manuring for perennial crops.)

Bergcultures, 1941, 15: 458-69, bibl. 35.

1360. HARVEY, C. 633.491

Potato variety trials.

Agric. J. Fiji, 1941, 12: 80-1.

In potato variety trials extending over 3 years the variety Up-to-Date from imported N. Zealand seed gave significantly the highest yields. Imported Irish seed of this variety was not superior to N. Zealand seed.

1361. INNES, R. F. 633.491-1.8

The residual effect of fish manure and artificial manures applied to Irish potatoes, as measured by a crop of Miss Kelly red peas.

J. Jamaica agric. Soc., 1941, 45: 215-7, bibl. 1.

The residual effects from applications of potassic artificial manures and fish manure containing potash as measured by their effect on red peas are substantially the same, being a significant increase in yield and quality which is attributed to the potash content alone. Two cwt. per

* Longevity of some farm crop seeds. *Philipp. J. Agric.*, 1935, 6: 343-57.

acre of sulphate of potash produces the same yield and quality of Irish potatoes and has the same residual effects on red peas as an application of 5-10-16 fish manure. In a previous article (*Ibidem*, pp. 161-5) the replacement of fish manure by sulphate of potash in the quantities indicated would mean a saving of 54s. per acre under pre-war conditions.

1362. POUND, F. J. 633.5
A survey of the possibilities of *Urena lobata* as a source of fibre in Trinidad.
Proc. agric. Soc. Trin. Tob., 1940, 40 : 303-5, 307-11, 313-7, 319-21.

Urena lobata, a malvaceous weed, occurring commonly in the tropics on waste land of the savannah or scrub type, is used in various countries as a source of fibre though apparently not grown commercially. Experimental cultivations have been made in Trinidad and the whole question thoroughly examined in the light of these trials and the experiences of other countries. This report discusses cultivation, preparation of the fibre, and costs, and provides very full information for intending planters. It is claimed that *Urena lobata* grown in Trinidad yields an excellent fibre comparable to, and useful as, a jute substitute. Manufacturers' reports from England and U.S.A. indicate that there would be a ready market at approximately the price obtaining for jute, provided care is taken in regular grading to agreed types and in preparation of the fibre.

1363. HAIG, J. C. 633.513-1.541.5
The vegetative reproduction of kapok.
Trop. Agriculturist, 1941, 95 : 164.

The necessity of using buds only from the main stem of the kapok (*Ceiba pentandra*) if an upright tree is desired was proved by experimental buddings. Some of the buds from laterals eventually became fairly upright but the type of tree so produced is undesirable.

1364. CULTUURTECHNISCH INSTITUUT. 633.523
 Cultuuraanwijzingen betreffende roselle (*Hibiscus sabdariffa* L.). (Culture of Java jute.)
Landbouw, 1941, 17 : 316-8, bibl. 8.

The requirements of the fibre plant *Hibiscus sabdariffa* are somewhat exacting if a good, even crop as regards length and thickness of the stems is to be obtained. The soil must be thoroughly well worked and manured, with a high humus content, well watered but also well drained. Inadequate drainage will result in black foot rot (*Phytophthora parasitica*) to which the plant is very subject. Propagation is by seed which is made to germinate before sowing. The germinated seeds are set about 6 inches apart in raised narrow beds and are not transplanted. The stems are cut when the first flowers appear. Retting is done in clean running water and takes 2-3 weeks. To assist the process, quick retting being important, the stems are first passed through mechanical scrapers. After retting the fibre is separated from the wood by hand and after further washings it is sun-dried and ready for sale. Some instructions are given for growing for seed production.

1365. RAMOS, M. M. 633.522-2.4
Dry sheath-rot of abacá caused by *Marasmius* and suggestions for its control.
Philipp. J. Agric., 1941, 12 : 31-9, bibl. 19.

- CELINO, M. S., AND OCFEMIA, G. O. 633.522-2.8
Two additional insect vectors of mosaic of abacá, or Manila hemp plant, and transmission of its virus to corn.
Philipp. Agric., 1941, 30 : 70-8, bibl. 16.

1366. BRIEGER, F. G., AND GRANER, E. A. 633.682-1.535
 Polaridade e regeneração nas estacas de mandioca. (Polarity and development of cassava cuttings.) [English summary.]
Rev. Agric., S. Paulo, 1941, 16 : 230-46, bibl. 7.

In a study of the physiological factors controlling the development of roots and shoots in cuttings of *Manihot* there was found a decisive polarity with regard to root formation which at first takes place only at the callus formed at the basal end of the cutting (the cuttings are laid horizontally in the soil with both ends covered, or on a slant with one end slightly protruding). One month

later roots are formed at the base of the new shoots and always at the same depth, about 5 cm. Shoot formation is governed mainly by the interaction of polarity and gravity. The intensity of both root and shoot formation depends on the depth at which the cuttings are planted. Culturally the horizontal position at a depth of 5 cm. is advised since it procures good rooting and the development of more than one stem per cutting without much difficulty. Time and trouble are saved since it is unnecessary to note which is the top and which is the bottom end.

1367. PHILIPS, D. 633.685
Manuring the yam hill.

J. Jamaica agric. Soc., 1941, 45 : 187.

The usual practice in manuring the yam hill is to open the hill and insert a foundation layer of farmyard manure or trash at the bottom and cover in, the hill being then assumed to be ready for the plant. Better results will be obtained if the manure is distributed in three-inch alternate layers with the soil throughout the hill.

1368. GADD, C. H., AND LOOS, C. A. 633.71-2.8
A virus disease of *Ageratum conyzoides* and tobacco.
Trop. Agriculturist, 1941, 96 : 255-64, bibl. 8.

Experiments carried out at the Tea Research Institute, Ceylon, showed that the weed *Ageratum conyzoides* is subject to one or more virus diseases transmissible to tobacco by white fly and allied to the virus or viruses which cause tobacco leaf-curl. The eradication of the weed from tobacco areas is advocated.

1369. VAN SCHREVEN, D. A. 633.71-2.8
 Bestrijding van mozaikziekte bij tabak met looistofhoudende oplossingen.
 (Control of tobacco mosaic with extracts of tanning substances.) [English summary 1 page.]
Landbouw, 1941, 17 : 222-30, bibl. 22.

It was found possible to disinfect hands contaminated with the juice of mosaic-diseased tobacco leaves by washing them in a 1½% or an 8% solution of tannic acid made from the galls which develop on *Rhus semilata*, as also in a ½% solution of a commercial tanning material. A 15% mimosa-extract solution from the bark of *Acacia decurrens* inactivated the virus within half a minute in certain tests which are described. A watery extract of mangrove bark was also effective. Such tannin solutions do not irritate the hands as do various chemical disinfectants which have been employed. Tannin solutions in use for a long time should have a fungicide added to prevent the growth of certain fungi which convert the tannin into other substances which fail to inactivate the virus. Virus-contaminated soil can be disinfected with a solution of tannin extracts. Nine other sap-inoculable tobacco viruses besides the ordinary one were found to be inactivated by these tannin solutions.

1370. BAĐENHUIZEN, N. P. 547.944.6 : 633.71 + 633.523
 De toepassingsmogelijkheden van verdubbeling van het aantal chromosomen door middel van colchicine-behandeling bij tabak en Java-jute. (A study of the possibilities offered by doubling the number of chromosomes in tobacco and Java jute (*Hibiscus cannabinus*) by means of colchicine.) [English summary 1 page.]
Landbouw, 1941, 17 : 231-51, bibl. 42.

ATTYGALLE, A. B. 633.71-1.56
Harvesting, curing and grading of cigarette tobacco.
Trop. Agriculturist, 1941, 96 : 201-11.

1371. GRIST, D. H. 633.72
The Malayan tea industry in 1940.
Malay. agric. J., 1941, 29 : 183-9.

The progress of the comparatively recently started tea industry in Malaya receives its annual review. The main feature brought out in the article and in the Editorial is that the area has increased by some 2,000 acres and that production now stands at over 1,600,000 lb. The

difficulties of export under present conditions and the disposal of the surplus amounting to about 50% of production are discussed.

1372. BOND, T. E. T. 633.72

The present position of tea selection in Java.

Tea Quart., 1941, 14: 23-30, bibl. 3.

A review based on recent papers by S. J. Wellensiek and J. H. van Emden respectively in *Bergcultures*, 1940, 14: 223-6 and 1941, 15: 118-24.

1373. THOMAS, A. S. 633.72

Some lessons from a tour of the tea districts of India.

E. Afr. agric. J., 1941, 7: 24-32, bibl. 3.

The broad principles of tea growing are discussed under the heads:—seed selection; soil cultivation and conservation; shade; estate planning.

1374. VAN EMDEN, J. H. 633.72-1.535

Mededeelingen inzake het stekken van thee II.* (The propagation of tea by cuttings II.) [English summary.]

Arch. Theecult. Ned. Ind., 1941, 15: 33-45, bibl. 3.

The paper deals with experiments on the rooting of tea cuttings in the open and with the effect of certain growth-promoting substances. At Buitenzorg, altitude 730 ft., cuttings of green and of brown wood with 1 and 2 internodes were planted in dense shade in 3 media, a lateritic loamy clay, soil mixed with compost, and soil and compost to which sulphur dust had been added. The green cuttings callused and died within 6 weeks; the brown cuttings died without callusing in 10 weeks. At Pasir Saronggé, 3,600 ft., some success was achieved with two-internode cuttings of half-ripened wood under light shade in ordinary soil. The unevenness of the take is ascribed to the individual properties of the different parent bushes. Of the growth substances tried Hormone A seemed to be most successful. Treated cuttings commonly produced roots from the epidermis in axial rows, usually below the leaf of the cutting. Non-treated cuttings always rooted from the callus. Transplantation of cuttings to the field so far has always caused great mortality.

1375. BAKHTADZE, K. E., KOLELISHVILI, M., SVADOVSKAYA, N. P., BEREZHNOI, I., KORSCHUNOFF, I. 633.72-1.535

The vegetative propagation of tea. [Russian.]

Soviet Subtropics, 1940, No. 11-12, pp. 16-7, 18, 19-20, 20-1.

This is a series of papers on the desirability of using vegetative methods of propagation for the tea plant with special reference to a recent article on the subject by Zaldastanishvili, *Ibidem*, 1940, No. 10, pp. 10-4; *H.A.*, 11: 919. Bakhtadze considers that the vegetative propagation of tea is a useful weapon in the hand of the breeder and selector but that its technique is too skilled and too costly to make it useful for the ordinary tea planter.

Kolelishvili considers that the method is not used merely because the technique is not understood. He refers to recent work at the Chakvinsk Tea Station on the rooting of tea cuttings. Svadovskaya ridicules the idea that tea bushes raised from cuttings or layers lack vitality. This theory has been disproved by the existence in Japan, Formosa and India of healthy plantations raised vegetatively many years ago. He draws attention to large-scale propagation trials by the Chakvinsk station in which 60-69% success was achieved in rooting cuttings in the summer without artificial heat, thereby eliminating a great deal of the cost.

Berezhnoi considers that the value of vegetative propagation of tea is proved beyond all controversy and that it only remains to select mother plants and lay out a comprehensive experiment involving material from many state and collective farms. Korschunoff sums up for the Ministry. The work in 1940 showed the possibility of considerably extending vegetative propagation methods as regards tea and methods of so doing will be investigated in 1941. Certain proposals of Bakhtadze for increasing the value of tea seed by artificial pollination methods will also be borne in mind.

* Part I, *Ibidem*, 1939, 13: 75-85, *H.A.*, 10: 524.

1376. SCHOOREL, A. F. 633.72-1.8
Resultaten van bemestingsproeven in de theecultuur. (**Results of the tea manurial trials.**)
Bergcultures, 1941, 15 : 518-27.

Manurial trials with tea are in progress on various soils at altitudes above 2,500 ft. in West Java under the direction of the West Java research station. The influence of the different soil types was very marked. While the general value of manuring seems proved the research station is unwilling to lay down any definite rules. All large estates should conduct trials of their own. The results are given in detail and are illustrated by graphs.

1377. DE HAAN, I. 633.72-2.19
Gebrekverschijnselen bij thee veroorzaakt door een tekort aan de belangrijkste minerale voedingsstoffen met uitzondering van kalium. (**Deficiency symptoms on tea other than potassium.**)* [English summary.]
Arch. Theecult. Ned. Ind., 1941, 15 : 1-24, bibl. 9.

The experiments were carried out at the West Java Research Station on young tea grown in pots in quartz sand. The various nutrients supplied primarily affect the growth of the plant. Data were collected with reference to the effects upon length, pruning weight and pekoe-burung periodicity and leaf production. These and the ash composition of young and old leaf and wood are recapitulated in tables. The external deficiency symptoms are described as regards leaf discoloration and plant habit. These deficiencies are illustrated in 6 coloured figures.

1378. THOMPSON, A. 633.72-2.4
Branch canker of tea.
Malay. agric. J., 1941, 29 : 152-4, bibl. 4.

Sun scorch received after pruning is considered to be the cause of the occurrence of cankers on the upper surface of horizontal branches of tea bushes at Cameron Highlands, Malaya. Overhead shade appears to afford the best control.

1379. GADD, C. H. 633.72-2.76
The life history of the shot-hole borer of tea [*Xyleborus fornicatus*, in Ceylon].
Tea Quart., 1941, 14 : 5-22, bibl. 10.

1380. DE GRAAFF, D. 633.73-1.541
Knopdifferentiatie en slaging van koffiëenten. (**Bud differentiation and success in coffee grafts.**)
Bergcultures, 1941, 15 : 1192-6.

Success in coffee grafting depends largely on the readiness of the buds to produce vegetative growth. A method by which this growth may be encouraged is described and illustrated. The selected scions are trimmed of their leaves, side shoots and youngest growth but are not removed from the parent tree until the new bud growth is about 1 cm. long or longer. (The most suitable length can be decided by the operator according to circumstances.) It is known that some rootstocks are slower than others in causing their scions to start into growth ; by the pretreatment of the scion this influence is largely reduced.

1381. SNOEP, W. 633.73-1.8
Resultaten van bemestingsproeven bij koffie in het Malangsch Ressor van het Proefstation Midden-en-Oost-Java. (**Results of coffee manurial trials carried out by the Mid and East Java Research Station at Malang.**)
Bergcultures, 1941, 15 : 1000-10.

Manurial trials with coffee in Java carried out by the Mid and East Java Research Station are discussed. The trials have been in progress for 9 or 10 years. Many results are tabulated and discussed and the following generalizations based on them are made. Intensive manuring of old coffee is almost certainly uneconomic. Intensive manuring of young coffee leads to rapid growth and early first cropping, but if manuring ceases the succeeding crops show a decline, while if manuring is continued the probability is that it will be uneconomic. A light manuring with

* For companion paper, Potassium deficiency in tea, by de Haan and Schoorel, see *Ibidem*, 1940, 14 : 43-81, and *Bergcultures*, 14 : 1292, 1336-9, *H.A.*, 11 : 195.

N on young plantations on poor soil might prove profitable, but if P is added the result will be uneconomic. (Soils deficient in these nutrients are not here considered. Obviously they must be supplied if only as a matter of insurance.) Each young coffee plantation should have its own manurial trials properly laid out and the results of these should be applied to the whole. The organic refuse from a plantation should always be returned to the soil, whatever the results of any organic manurial trials may be, and without any attempt to assess the value economically. Leguminous cover crops, particularly in the form of *Leucaena* shade trees, of which the leaves and branches form a good mulch, are very valuable but whether these cover crops should themselves be manured needs further research. Research on methods of manuring coffee should only be conducted when it is possible to combine field work with physiological investigation.

1382. MAYNE, W. W. 633.73-2.4
The possibility of reducing the strength of bordeaux mixture for the control of coffee leaf disease. Fourth report.
Plant. Chron., 1941, 36 : 175-8, bibl. 6.

From data at present available it is considered that when extreme economy is essential bordeaux mixture 1½-1-40 for 1st and 2nd sprays or even 1-1-40 will give a substantial degree of control over coffee leaf disease in Madras. The general use of weak mixtures is not recommended. Two sprays of 1-1-40 will give better results than one of 2-2-40 in hot weather.

1383. COOLHAAS, C. 633.73+633.912+633.74
 Een overzicht van de werkzaamheden van het Proefstation Midden en Oost-Java in 1940. (**A survey of the activities of the Mid and East Java Experiment Station in 1940.**)
Bergcultures, 1941, 15 : 676-85.

The survey deals chiefly with breeding work and the behaviour of new clones of coffee, rubber and cacao. The control of pests and diseases is given considerable attention. Some work was done on the influence on the soil of certain cover crops but no information is given beyond the fact that mulching greatly increased the nitrate in the soil. Investigations in several other directions receive brief mention.

1384. SCHWEIZER, J. 631.8 : 633.73+633.912
 Wat haalt een koffie- en rubber-aanplant uit den grond en wat geven zij aan den grond terug. (**The withdrawal and restoration of soil nutrients in coffee and rubber plantations.**)
Bergcultures, 1941, 15 : 704-11, bibl. 13.

The studies (which are termed preliminary) include not only coffee and rubber but their respective shade trees, *Leucaena pulverulenta* and *Erythrina micropteryx* (dadap).

1385. TOLLENAAR, D. 633.74-1.541.11
 De beteekenis van het onderstamvraagstuk voor de cacao-cultuur. (**The significance of the rootstock question in cacao.**)
Bergcultures, 1941, 15 : 553-6.

In pointing out the need for the improvement of cacao in Java it is suggested that the Angoleta, Djatiroenggo and Forastero hybrids show such marked variations as to afford great opportunities for the selectionist. A study of the question of rootstocks is particularly important. An instance is quoted and supported by photographs of the good growth and yield made by Angoleta hybrids on Forastero rootstocks, whereas on their own roots under comparable conditions they were weedy and unprofitable. There were also considerable differences in vigour between various Forastero families of similar age. When these were budded (in this case with white cotyledoned Djatiroenggo clones) a clear correlation was found between vigour of stock and vigour of the resulting budded tree.

1386. CHEESMAN, E. E. 633.74
Field experiments of the botanical section.
10th A.R. on Cacao Research for 1940, I.C.T.A. Trinidad, 1941, pp. 3-11.

No experimental results are available and advantage of this is taken to present details of 6 field experiments already planted or being planted. The information comprises history, particulars

of layout and objects. Each experiment has a permanent serial number which will enable it to be followed through successive annual reports.

1387. HUMPHRIES, E. C. 633.74-2.19
Progress report on "Studies in the physiology of *Theobroma cacao* with special reference to cherelle wilt".
10th A.R. on Cacao Research for 1940, I.C.T.A. Trinidad, 1941, pp. 12-22.

(1) Repetition of last year's experiments confirmed the previous conclusion that cherelle wilt is primarily due to competition between pods for water and nutrients. (2) The effect of removing a maturing crop from the tree on the subsequent development of cherelles. The removal of the pods unexpectedly greatly increased setting. Reasons may be that the increased amount of nutrient available causes increased flowering, that fertilized ovules can develop more readily, that an inhibitor produced by the pods already on the tree is removed. As regards the object of the experiment it is most probable that the removal of developing pods allows more cherelles to reach maturity because of the greater amount of nutrient thus made available. (3) Mineral uptake of the developing crop during a complete season. Maximum increment of potash occurred when the pods were maturing. Greater cherelle wilting was observed in the trees (2 out of 5) which showed little increase in potash uptake during this period. (4) The variation in wet cacao per pod throughout the season. The amount of fresh cacao per pod declined with the advent of the dry season and the curves of the seasonal variation in weight and of the rainfall seemed to run parallel. Records of soil moisture variations were not available. (5) A study of certain aspects of the metabolism of the developing fruit and an attempt to explain why the fruit is more susceptible to wilt during its early development. Laboratory studies are still in progress on (a) the water relations of different parts of the pod at various stages of development, (b) the metabolic changes occurring in the pod at various stages of development. (6) An investigation into the frequency of leaf flush in the cacao tree. The flushing habit of cacao is of interest to the entomologist on account of thrips control, to the mycologist on account of witches' broom control and to the physiologist because of its part in the general nutrition of the tree. Observations are not yet completed.

1388. BIRCH, H. F. 633.74-1.56 : 581.192
Changes in the nitrogenous components of Forastero cacao during fermentation. Proteins and protein-decomposition products.
10th A.R. on Cacao Research for 1940, I.C.T.A. Trinidad, 1941, pp. 22-33, bibl. 16.

1. Changes in the total nitrogen content and the content of proteins and protein decomposition products in the cotyledons of Forastero cacao were studied during a 12-day fermentation. 2. There was a decrease in the total nitrogen and protein nitrogen contents throughout the period while the soluble nitrogen content showed an increase during the first four days and decreased thereafter. For all cases, the rate of change was greatest during the second day. 3. It is concluded that major changes in the protein content take place during a short period following the death of the cotyledons (in this instance during the second day), and that thereafter there is a slight decrease only. The loss of soluble nitrogen compounds is considered to be a continuous one throughout the fermentation process, in the early stages the rate of loss being exceeded by the rate of increase due to rapid protein breakdown. [Author's summary.]

1389. BILLES, D. J. 633.74 : 581.162.3
Pollination of *Theobroma cacao* L. in Trinidad, B.W.I.
Trop. Agriculture, Trin., 1941, 18 : 151-6, bibl. 12.

Evidence of the method of cacao pollination is still somewhat inconclusive. The possibilities of water-pollination by rain and dew drops, of wind-pollination and of insect-pollination are all discussed and the two former shown to be ineffectual. The only insect visitors sufficiently numerous or efficient are a midge, *Forcipomyia* sp., the cacao flower thrips, *Frankliniella parvula* Hood, and the aphid *Toxoptera aurantii* B. de Fonsc. It is shown that the female of the midge *Forcipomyia* sp. is perfectly adapted for the pollination of the cacao flower and through its efficiency is thought to compensate for its comparative rarity. It is the only one of the three possible insect pollinators seen to carry the pollen from tree to tree. While the thrips and the

aphid can procure effective pollination in self-compatible trees it is quite impossible for them to effect cross-pollination in self-incompatible trees which thus depend for their crop on the presence at the appropriate time both of self-compatible flowers and of the midge.

1390. HARDY, F. 633.74-1.8

The teachings of the Dominica cacao-mulching experiment.

Trop. Agriculture, Trin., 1941, 18: 75-84.

A mulching and manurial experiment on cacao, carried out over a period of 30 years at the Dominica Botanic Station, is described in historical, chemical and agricultural aspects. No definite evidence could be adduced to prove that the addition of large amounts of mulch caused increments of yield that could not be explained satisfactorily by its content of nitrogen, phosphate and potash, although the liberation of carbon dioxide might be expected to enhance the supply of available nutrients in this "young" volcanic alluvial soil to a much greater extent than could be expected in the more developed and less mineral-rich soils of Trinidad, Tobago and Grenada. In these islands nitrogenous manuring has seldom proved beneficial whereas in Dominica, provided the potash supply is adequate, nitrogen proved the most effective manurial ingredient for the soil of the experimental area.

1391. BAKER, R. E. D., AND CROWDY, S. H. 633.74-2.4

Witches' broom disease investigations. I. Seasonal variations in intensity of infection and their effect on control methods.

Trop. Agriculture, Trin., 1941, 18: 107-16.

The work on witches' broom (*Marasmius perniciosus*) carried out over the past 10 years, much of it unpublished, by the Trinidad Department of Agriculture and that of the Imperial College of Tropical Agriculture are reviewed. Up to the present the only seriously attempted control has been the removal of brooms, and until resistant varieties are available and in bearing over a large area this still appears to be the only method of any value. It will, however, be necessary to modify on practical and economic grounds the suggestion that the brooms should be cut out every three months, this being the time required by the broom to produce fructifications. Experiments should be laid down at once to determine the control obtained by removing the brooms twice yearly only, i.e. during June and July when formation and fruiting is at a minimum, and again in October and November to deal with those overlooked. Four important factors which may militate against the success of the scheme are discussed, namely, expense, failure to remove brooms invisible from the ground, the effect of wind-blown spores from neglected estates and the possibility that cutting off infected cushions may not remove infection.

1392. GOLDING, F. D. 633.74-2.78

Two new methods of trapping the cacao moth (*Ephestia cautella*).

Bull. ent. Res., 1941, 32: 123-31, bibl. 3.

Two new methods have been devised in Nigeria for trapping the adult cacao moth, *Ephestia cautella*, a pest of stored cacao. 1. Broom strands, i.e. the midribs of leaflets of the oil palm, *Elaeis guineensis*, or of the wine palm, *Raphia sudanica*, or some similar material are dipped in an adhesive made by heating 3 parts of coagulated latex of *Carpodinus* sp. with one part shea butter or palm oil and suspended from twine in the alley ways between the stacked bags. 2. Dish traps containing a solution of carbolic soap, 1 to 2 oz. soap per gal. water. Other soaps proved nearly as effective. The infestation of groundnuts by *Ephestia* is also discussed. If the export season for these nuts could be reduced from 12 to 7 months there would be a marked reduction in the ravages of these and other pests.

1393. CULTUURTECHNISCH INSTITUUT. 633.812

Cultuuraanwijzingen voor rozengeranium (*Pelargonium radula* l'Herit.) (Cultivation of *P. radula*.)

Landbouw, 1941, 17: 252-4, bibl. 1.

In Java *Pelargonium radula*, the source of geranium oil, to be grown at a profit requires a fertile permeable soil, an altitude of not less than 3,000 ft. with an annual rainfall about 2,000 mm. In dry districts it can be irrigated. Propagation is by cuttings. The Java plants originate from stocks imported from Réunion and though they flower regularly they have never set seed.

The most successful cuttings are from the upper part of the shoot, i.e. above midway, about 15 cm. long and with the upper leaves left on. They should be exposed to the air for 6 hours or so before setting in the cutting beds. These beds run north and south and have a rainproof palm or other thatch sloping from east to west, 1.25 m. at the higher and 90 cm. at the lower side. In two months' time the cuttings are ready for the field. The covering thatch is taken off a fortnight before planting. The plants, set out 80 × 80 cm., are planted firmly and well watered and earthed up one month after transplanting. After harvest a light application of sulphate of ammonia may be given. The two usual ways of harvesting, which first takes place 6 months after planting when the lower leaves begin to turn yellow, seem to be the heavy cutting back of all the shoots or of the older shoots. If this is done in dry weather there may be a considerable number of plants which fail to grow again. Trials are in progress to determine the best methods of harvesting and the probable length of life and yield per hectare of a plantation. The oil comes mostly from the leaves, the stems produce none and the leaf stalks but little. Occasional outbreaks of *Gloeosporium* and of *Rhizoctonia solani* (root rot) have proved difficult to deal with.

1394. PAUL, W. R. C., AND FERNANDO, M. 633.825
Cultural experiments with turmeric (*Curcuma domestica* Val.). I. The influence of mulching and of the size of seed on the yield of some varieties of turmeric.
Trop. Agriculturist, 1941, 96 : 265-8.

In trials carried out in 1940-1 at the experiment station, Nugawela, Ceylon, the variety Guntur gave a higher yield than Poona or the local variety. A large increase in yield was obtained by mulching with rice straw at the rate of 6 tons to the acre, probably on account of the manurial value of the straw. Reduction in the size of seed depressed yields considerably.

1395. VENEGAS, F. G. 633.825
 Consideraciones sobre el cultivo del jengibre. (**Cultivation of ginger.**)
Rev. agric. Guatemala, 1941, 18 : 66-9, reprinted from *Rev. Agric. Cuba*, date not given.

1396. JONES, S. 633.83-2.76
Cardamom beetle and its control.
Plant. Chron., 1941, 36 : 260.

Investigation carried out at the Pampadampara Cardamom Research Station, Travancore, show that the weevil, *Prodiocetes haemalicus*, a dangerous pest of cardamom, can be controlled by rooting out and burning the diseased cardamom clumps combined with hand-picking the adults when they come out for mating following the first showers before the monsoon rains, about the second week in April. The beetles then sit exposed on the plants for some days.

1397. GREENWAY, P. J. 633.87+633.86
Dyeing and tanning plants in East Africa.
Bull. imp. Inst. Lond., 1941, 39 : 222-45, bibl. 24.

An alphabetical list of 260 plants that might be of value as sources of dyes and tannins in East Africa. Apparently the arts of dyeing or tanning were never known to the natives of East Africa in contradistinction to the West Coast where local cloth was dyed extensively. Brief notes are given on the plants mentioned, on the East African countries in which a particular plant is known, on its uses and, if a dye, on its colour.

1398. KANNANGARA, A. W. 633.88
The preparation of arecanut for the market in Mysore with brief notes on its cultivation.
Trop. Agriculturist, 1941, 96 : 187-200.

The article is a result of a visit to Mysore to study the cultivation and processing of areca or betelnut (*Areca catechu*) with a view to reorganizing the areca industry of Ceylon. An interesting and detailed account is given of the methods used and comparisons are made with the more haphazard operations of the Ceylon peasant cultivator, as a result of which export, mainly to India, is decreasing rapidly, as are the prices obtained. Areca palms are much more numerous in Ceylon, grow more easily and have a higher yield. Systematic cultivation and careful processing should enable Ceylon nuts to face competition in any part of the world.

1399. CULTUURTECHNISCH INSTITUUT. 633.88
 Cultuuraanwijzingen voor *Orthosiphon grandiflorus* Bold. (Koemis koetjing,
 remoedjoeng). (**Culture of *Orthosiphon grandiflorus*.**)
Landbouw, 1941, 17: 314-5.

Instructions are given for the cultivation and after treatment of the medicinal plant *Orthosiphon grandiflorus*. Cuttings raised in nursery beds root in 10 days and are planted out, preferably on a sunny site, 2 weeks later. The leaves up to the 4th pair, including the stem, are picked when the flower buds begin to show. Drying is done in a hot air current (45-50° C.) passing over enclosed racks bearing the leaves and is continued until the leaf will crack when handled without turning to powder. The dried produce must be light green in colour and free from mould, it should possess an aromatic, non-musty smell and the moisture content must not exceed 14%. The extract content, which depends on the season of plucking, must amount to not less than 30% computed from the dry material.

1400. EVANS, G. 633.88.51
The possibility of extending *Cinchona* cultivation in the British Empire.
Emp. J. exp. Agric., 1941, 9: 111-24, bibl. 15.

A historical note is given of the development and vicissitudes of *Cinchona* cultivation in all countries where it has been attempted. Present-day methods in India and Java are described. The factors necessary to establish a cinchona industry within the Empire are discussed. Among these are proper financial backing and an organized official drive against malaria, which would ensure increased consumption, and the establishment of a proper system of distribution. The fact that the Dutch Kina Bureau of Java controls the quinine market and could considerably expand their output must also be borne in mind.

1401. POPENOE, W. 633.88.51
***Cinchona* in Guatemala.**
Trop. Agriculture, Trin., 1941, 18: 70-4.

An account of the progress made and methods employed in the establishment of commercial *Cinchona* cultivation in Guatemala. Wherever possible it is hoped to establish *ledgeriana* types on their own roots rather than graft them on *succirubra* as is done in most other quinine countries. The raising of *succirubra* seedlings for rootstocks presents little difficulty. Ledgers, however, require good technique and attention to detail. The seeds must be kept uniformly moist while germinating and be given very little light. If allowed to dry out after they have begun to swell they die. After germination, which takes place in 20-30 days, a delicate adjustment of light and ventilation and possibly the use of a bordeaux spray will be necessary to control damping off for a few weeks by which time full light, though not direct sunlight, will have been admitted. The seedbeds are surfaced with a shallow layer of rich forest loam or leaf mould. The seeds are sown at the rate of 2-3 grams per sq. yard (a gram contains 2,000-3,000 seeds). Raking the surface soil gently with a very fine-toothed rake after sowing encourages germination. In 6-10 months the seedlings, now about 2 inches high, are transplanted to nursery beds after a period of gradual hardening to the sun's rays. The transplants are set 6×6 inches apart and kept shaded for a time. If properly hardened off *Cinchona* seedlings transplant readily even with bare roots. Grafting technique seems to differ slightly from that used in Java.* The scions of half-ripened wood are 4 inches in length and carry 2 joints from which the leaves are cut off. A diagonal cut 2 inches in length at the base of the scion is placed against a long shallow cut on the side of the stock, bound with prepared tape and covered with grafting wax. Grafted plants are transplanted to the field a year after the operation, and seedlings a few months after transplanting to nursery beds (the exact time is not stated). Spacing in the field is from 4×4 feet to 10×10 feet, the former distance necessitating a later thinning out.

1402. SCHWEIZER, J. 633.912
 Hevea-plantmateriaal in Besoeeki. (**A survey of 20 years' selection work on rubber at Besoeeki Research Station, Java.**)
Bergcultures, 1941, 15: 598-609, bibl. 12.

* Vegetative propagation of tropical and sub-tropical plantation crops. Tech. Commun. 13, 1940, Imperial Bureau of Horticulture, East Malling, 3s. 6d.

1403. LAMMERS, R. P. 633.912:1.532
 Eenige verdere gegevens over het splitsen van *Hevea*-kiemplanten. (Further observations on the production of rubber plants by twinning.)
Bergcultures, 1941, 15 : 397-8.

Comparisons made at the Besoekisch Proefstation, Java, between seedling *Hevea* and similar plants twinned by the Ramaer method showed that the twinned plants at two years old were about 25% less forward than the normal seedlings but that the difference lessened as the plants aged. Complaints had been received that twinned plants were unduly subject to sun scorch. It was shown that this was not the case if proper care was taken. A comparison was also made between plants twinned by the Ramaer method, by the Gambar method and plants made into triplets. The last method consists in cutting a strip containing a cotyledon, the axis bud and side roots from each side of the young plant, leaving the central shoot with its tap root, practically no side roots and no cotyledons. There is a very high mortality both in the seedbed and after planting out, and development, especially of the central shoot, is retarded. In the Gambar twinning method, in which the cotyledon, etc., is removed from one side only, the mortality a year after planting was for the main shoot 4% and for the side shoot 30%. The Ramaer method, in which the germinating seedling is split through longitudinally instead of just above the cotyledon, gave a mortality of 20%. There had been earlier losses in the seedbeds, especially heavy among the triplets. The author prefers the Gambar method, though total losses were the heavier, to the Ramaer. The triplet method is not worth while. [See *H.A.*, 11 : 213.—ED.]

1404. PYKE, E. E. 633.912 : 581.144.1 : 681
 Trunk diameter of trees of *Hevea brasiliensis* : experiments with a new dendrometer.
Nature, 1941, 148 : 51-2, bibl. 3.

The author describes in detail a new instrument devised at the Rubber Research Institute, Kuala Lumpur, for recording the daily changes which occur in the trunk diameters of rubber trees and so allowing a determination to be made of the extent to which the outflow of latex on tapping affects the diameter in the region of the cut. Such an instrument is of necessity more sensitive than MacDougal's dendrograph.* The instrument is illustrated and results to date are graphed and discussed.

1405. MULDER, H. H. 633.912 : 612.014.44
 De nieuwe "domper-kroon-ontwikkelingsmethode" bij jonge rubber. (The new "snuffer" crown developer for young rubber.)
Bergcultures, 1941, 15 : 472-4.

A method is described for developing a satisfactory bushy crown on young rubber plants, a number of otherwise good clones being noted for their unsatisfactory crowns. The method consists simply in crowning the top of a new flush at about 9 feet with a cylinder of brown paper 4 inches long closed at the upper end and made watertight by dipping in paraffin wax. The cylinder is put on before the young leaves are far developed and they are included within. It is removed 8 days later. The young leaves develop no further but soon fall off, leaving a bare stem which within two weeks will have put out a bunch of shoots forming a solid crown. The article is well illustrated with photographs.

1406. CHAPMAN, G. W. 633.912 : 581.192 : 631.8
 Leaf analysis and plant nutrition.
Soil Sci., 1941, 52 : 63-81, bibl. 19.

A technique is described for studying the relations existing between the nutritional status of a plant, in this instance rubber (*Hevea brasiliensis*), and the N, P and K content of its leaves. Factors other than nutritional influencing leaf composition are described with their bearing on leaf sampling. Rapid chemical methods permitting analysis of a large number of samples are necessary but need only reach a moderate standard of accuracy. The interactions of N, P and K in relation to leaf composition were studied in a series of factorial pot experiments. In field

* MacDougal, D. T. Growth in trees and massive organs of plants. Carnegie Inst. Wash., 1924.

experiments the leaf composition and growth rate of rubber are shown to be correlated. The effect of phosphates on the penetration of ammonia nitrogen is very marked. The depression of nitrogen absorption by phosphatic fertilization is primarily a soil phenomenon. Nutrient balance among the fertilizers applied to the soil is thus important but the author holds that the theory of the importance of the nutrient balance within the plant as distinct from the reactions in the soil outside has no evidence to support it. The relations between leaf composition and growth rate can be better explained on the basis of Liebig's law of minimum factors than on any theories of balance.

1407. WHELAN, L. A. 633.912-1.8

Manuring under war conditions.

Quart. Circ. Ceylon Rubb. Res. Scheme, 1940, 17 : 267-71.

The suggestions made for modification in the manuring of rubber under war conditions are as under. Although on the experimental areas response of young rubber on replanted clearings to manuring has been disappointing, the applications should be continued as a safeguard against any check to growth. Young rubber on newly cleared jungle may be manured or not, the decision being based on appearance and depth of soil and on the growth of the plants. Mature rubber in poor condition when the programme has already been started should continue to receive manure. Mature rubber in satisfactory condition need not be manured.

1408. WHELAN, L. A., AND DE SILVA, C. A. 633.912-1.8

Field experiments on Dartonfield Estate XIV. Manuring experiment with mature rubber (1940).

Quart. Circ. Ceylon Rubb. Res. Scheme, 1941, 18 : 5-12.

In an experiment to ascertain the manurial requirements of mature rubber at Dartonfield Estate manured plots gave a significantly higher yield than unmanured and NPK mixture gave better results than NP. Manuring did not affect girth increment or bark renewal. The broadcasting of 200 lb. sulphate of ammonia (containing 40 lb. nitrogen) per acre gave an economic return at pre-war prices but the addition of the same amount of phosphoric acid and of potash has not so far been economically justified.

1409. N.M. 633.912-1.874

Nog eens bodembegroeiing in jonge heveatuinen. (A ground cover for young hevea plantations.)

Bergcultures, 1941, 15 : 622-5.

A mixture of *Clibadium surinamense* and *Centrosema pubescens* is advised as ground cover for young rubber. The former is described as a quick-growing herbaceous bush which makes a fair amount of stem but not many leaves. The *Centrosema* climbs strongly over this plant often in situations where *Centrosema* will not grow alone and forms a thick canopy which effectively stifles all weeds, prevents erosion and supplies to the soil a great quantity of organic material. *Clibadium* is not incommoded by this overgrowth and penetrates through it to the light. It is, however, necessary when preparing the ground for this cover to remove such strong-growing weeds as *Saccharum spontaneum* and *Imperata cylindrica*.

1410. FARQUHARSON, J. D. 633.912-1.542

Rubber branch pruning.

Quart. Circ. Ceylon Rubb. Res. Scheme, 1941, 18 : 24-8.

The modern method of planting more rubber trees than will eventually be required leads to an upward rather than an outward growth of the branches. As a result the rain is diverted down the trunk and over the tapping panel. Wet bark is a serious factor in commercial tapping and will adversely affect test tapping for thinning purposes. Furthermore, on certain loose soils the weight of the crown may lead to severe leaning and wind damage. Three treatments, the choice depending on clonal characteristics, are suggested, namely, (1) branch pruning or thinning, (2) complete pollarding of certain clones, (3) the pollarding of certain trees, especially in relation to clonal seed clearings. The methods of carrying out the treatments, with special reference to individual clones, are described and illustrated.

1411. SCHWEIZER, J. 633.912-1.55
 Bijdrage tot de physiologie van den z.g. "Hoogtap". (On the physiology of high tapping in *Hevea*.)
Bergcultures, 1941, 15 : 1214-28.

The physiological results of high tapping rubber in addition to the normal tap are carefully examined and the conclusion is reached that the tree or quality of the latex is unaffected and that in times when rubber is urgently needed, as at present, the operation is economically justified.

1412. NIEUWPOORT, D. 633.912-1.56
 Hoogtap. (High tapping of rubber.)
Bergcultures, 1941, 15 : 533-40, bibl. 15.

Particulars are given of a high tapping system which has been under investigation on a rubber estate in Java for several years. The results so far have more or less confirmed those of other investigators, namely, (a) that latex from the upper part of the tree has a higher rubber content than that from lower down, (b) the quantity of latex is so much greater from the lower part of the trunk, i.e. at the ordinary tapping height, that in spite of its lower concentration the lower tap gives the higher yield of rubber.

1413. PHILPOTT, M. W. 633.912-1.564
 Packing raw rubber.
Quart. Circ. Ceylon Rubb. Res. Scheme, 1940, 17 : 272-7.

A short account is given of the methods now in use in packing raw rubber, together with an indication of probable future developments.

1414. GREENWAY, P. J. 633.956
 Empire production of drugs. II. Camphor.
E. Afr. agric. J., 1941, 7 : 20-3, bibl. 8.

Camphor, *Cinnamomum camphora*, either synthetic or natural, is one of the drugs listed by the Medical Research Council with a rider to the effect that special efforts should be made to increase production within the Empire. Optimum environment is a well-drained, fertile sandy loam and a sheltered situation in a tropical or sub-tropical climate with a high rainfall, say 90 in. or over. In America the tree has survived temperatures down to 15° F. Propagation may be by seed, layering, root cuttings provided they have good buds, and budding and grafting. The stocks chiefly used are *C. glanduliferum* and a camphor-free strain of *C. camphora*. Camphor for distillation is grown for the leaves in hedge form. Should the plantation prove unprofitable the trees can be allowed to grow up to supply a durable wood for cabinet work or fuel, while if production again becomes attractive the trees can be felled and the aerial parts distilled. The stumps will coppice freely and provide material for distillation according to the original plan. There is, unfortunately, considerable variation between trees in proportionate yield of solid camphor and oil and also in the nature of the oils produced. Environment is thought to contribute to this. The first harvest of leaves and twigs can be taken in 3 years from seed. Notes are given on distillation and uses.

1415. VARMA, S. R. 634.441-1.541
 A novel mango graft.
Punjab Fruit J., 1941, 5 : 957.

Mango seeds of the variety Malda were germinated in wet moss at the Panjaus Garden, Patiala, in July, 1940. The young shoots were grafted with equally tender terminal shoots of Lucknow Sufeda mango a month later. In October "the grafts were separated as perfect trees" ready for transplanting to nursery or plantation. Under the usual methods the mango stock has to be a year old before it can be budded or grafted. [The method of grafting is not stated. Does the use of the word "separated" indicate by approach? Successful experiments in the grafting of germinating mango seedlings are described by Traub and Auchter, *Proc. Amer. Soc. hort. Sci.* for 1933, vol. 30 on pp. 385-6. In this case a wedge graft is inserted in a cleft made between the cotyledons.—ED.]

1416. THAKURTA, A. G., AND DUTT, B. K. 634.441-1.534/535
Vegetative propagation of mango from gootes (mareotte) and cuttings by treatment of high concentration auxin.
Curr. Sci., 1941, 10 : 297, bibl. 1.

The application of 3% indoleacetic acid to the ringed portion of marcots when wrapping and to a girdled section at the base of a cutting 24 hours before severance from the mother plant proved a very successful method of rooting when young mangoes 2-3 years old were the parent plants. Cuttings from untreated controls or from treated mature trees did not root. 1% and 3% naphthaleneacetic acid was ineffective.

1417. BANNERJEE, H. K., AND KAR, B. K. 634.441 : 581.12
Catalase activity in *Mangifera indica*.
Curr. Sci., 1941, 10 : 289-90, bibl. 3.

The natural drift of such enzymes as catalase, oxidase and peroxidase in the life of the mango fruit from fruit setting to ripening clearly showed a close correlation with the distinct metabolic phases of the fruit. A correlation table is provided in illustration. A second table records the enhanced catalase activity under artificial doses of ethylene as compared to cool storage at 8-12° C. and to room storage at 28-32° C.

1418. GARCIA, G. M. 634.5 : 581.192
A comparative study of nutrients of nuts of pili (*Canarium ovatum* Engler).
Philipp. Agric., 1941, 30 : 96-106, bibl. 10.

In this analysis of content of pili nuts grown at the College 28 samples of kernels from 28 different trees growing under more or less the same conditions of soil and environment were analysed. The pulp ranged from 55.23 to 67.64, av. 62.26%, kernel 15.59 to 26.54, av. 20.59% ; moisture 11.08 to 35.06, av. 23.74% ; ash 2.78 to 3.52, av. 3.11% ; fats 74.79 to 83.62, av. 78.55% ; protein 12.06 to 16.42, av. 13.91% ; crude fibre 0.83 to 4.67, av. 1.86% ; nitrogen-free extract 0.03 to 5.14, av. 2.55% ; calorific value 740 to 800, av. 770 calories per 100 gm. oven dry sample.

1419. MENDIOLA, N. B. 634.571
Introduction and trial culture of Java nepheliums in the College of Agriculture.
Philipp. Agric., 1941, 30 : 168-96, bibl. 10.

Rambutan, *Nephelium mutabile*, and kapulasan, *N. lappaceum*, have been introduced successfully to the Philippines from Java by seed. Seed of *N. mutabile* packed in cans or in a paper packet remained viable for at least 20 days and gave a 64% germination. Rambutan from seed first fruited when 10 and kapulasan when 7 years old. Kapulasan seemed to need more shade and water than rambutan. Introduced plants of both species have been successfully marcotted and kapulasan has been successfully inarched on stocks of the same species. Kapulasan inarched on rambutan formed unions but, with one exception out of six, grafts died after separation from the mother plant. Both species have produced parthenocarpic fruits.

1420. MAHNGAR, B. S. 634.571
Litchi and its cultivation.
Punjab Fruit J., 1940, 4 : 816-7.

Brief notes of the essentials of litchi cultivation in India.

1421. MORADA, E. K. 634.573
Cashew culture.
Philipp. J. Agric., 1941, 12 : 89-103, bibl. 11.

The cultivation of the cashew (*Anacardium occidentale*) in the Philippines is described. Propagation is mainly by seed in permanent quarters, the plants coming up fairly true to type. One or two seeds are planted in holes 1.5-2.5 in. deep, the holes being 6-8 metres apart. Only one seedling is allowed to grow. Catch cropping with bananas (and other crops in the first year) is carried out and cover cropping is adopted from the second year with *Centrosema pubescens*, *Calopogonium mucunoides* and *Indigofera endecaphylla*. Weeds should be cut twice a year and used as mulch. Fertilizers appear to be generally unnecessary. Cashews should bear fruit in 3 years from planting. Good sized trees give a maximum production of from 1,000 to 1,700 fruits with 7 to 15 kg. nuts. Pests and diseases are few. Notes are given of Indian methods of processing and of the method of making cashew wine as worked out by the Plant Utilization

Division, Bureau of Plant Industry. About 500 fruits should suffice to make 20 litres of wine. There is a very large import of cashew kernels into the U.S.A. from India and there seems no reason why cashew growing should not prove profitable in the Philippines.

1422. EJERCILO, J. M., AND JAMIAS, J. 634.58
Peanut culture.

Philipp. J. Agric., 1941, 12 : 107-18, bibl. 6.

An account of the best current practice for peanut growing in the Philippines. The area planted in 1938 was 6,420 ha. with a production of 3·8 million kg. Propagation is by seed. Two crops are raised in the year, after which peanuts are not grown again for 2 or 3 years. Seed requirements per hectare are 26-30 kg. of shelled seeds. The seed needs a rest period of 5 or 6 months between harvesting and planting. A complete fertilizer is recommended together with lime and compost. Curing is done on posts. Pests and diseases are few.

1423. BURMA, DEPARTMENT OF AGRICULTURE. 634.58
Groundnut.

Markets Section Survey Dep. Agric. Burma 2, 1941, pp. 73, As. 8 or 9d.

An account of the cultivation of groundnut in Burma and of its harvesting, processing and marketing. Statistics of sowings, production and value of the crop are given in considerable detail.

1424. REYES, G. M., AND ROMASANTA, R. 634.58-2.48
Varietal susceptibility of peanuts to black spot (*Cercospora personata* (B & C.) Ell. & Ev.).

Philipp. J. Agric., 1940, 11 : 371-80, bibl. 9.

Black spot caused by *Cercospora personata* is a most destructive disease of the peanut (*Arachis hypogaea*) in the Philippines. The damage caused by the disease is described. Certain named varieties have shown better resistance than others and should be planted exclusively; they are:—Taitau, Georgea Red, Valencia, San José No. 3 and Tirik.

1425. DEPARTAMENTO NACIONAL DE AGRICULTURA, COSTA RICA. 634.58
Cultivo del mani. (Peanut cultivation in Costa Rica.)
Rev. Dep. nac. Agric. Costa Rica, 1941, 6 : 133-5.

1426. LUCY, A. B. 634.6-1.517+1.874
A comparison between natural covers and clean-weeding on yields of oil palm.
Malay. agric. J., 1941, 29 : 190-3.

A temporary increase in yield followed by a decline that will almost certainly be permanent resulted from clean weeding coconuts on sandy loam of rather low fertility in Malaya. The adoption of "forestry" treatment, otherwise selective weeding with a twice-yearly trimming of cover to about 4 feet resulted in a slow decline until the fourth year. Thereafter yields increased and it can be assumed that the loss will be more than made up during the fifth and subsequent years.

1427. WILSHAW, R. G. H. 634.61-1.8
Results of a manual experiment on coconuts.
Malay. agric. J., 1941, 29 : 145-51, bibl. 1.

With poor mature coconut palms growing on coastal clay in Malaya a single dressing of $\frac{1}{2}$ ton of lime per acre produced beneficial effects in yield of nuts and weight of copra, lasting over 5 years. The effect of lime was apparently not due to calcium ion but, it is suggested, to overcoming aluminium toxicity. Investigations of this latter hypothesis are to be continued. The slight response to phosphate indicated seemed to lie in more nuts than in increased copra content.

1428. BRUCE, A. 634.61-1.84
Periodicity of nitrification. III. Coconut area.
Trop. Agriculturist, 1941, 96 : 76-81.

The coconut tree removes large quantities of plant food from the land. It forms nuts all the year round and has no resting period. It is a case of continual elaboration for 70-80 years of

the raw products in soil and air. It returns little to the soil since the cell contents of the foliage are absorbed into the main body of the palm before the leaves are severed by the leaf callus. In Ceylon the continued use of manure gives good results. Spasmodic applications do not. Nitrification rate and total nitrogen of 5 estates is worked out and the years of life predicted on the assumption that all the nitrates formed were absorbed by the plants or taken from the estates by other means such as seepage. As the estates are all much older than their predicted nitrogen life it appears that nitrate production is not a wasting asset on the estates owing to the nitrates being immobilized by proteinization and retained in the soil until nitrification conditions recur. Such conditions only occur on properly cultivated estates.

1429. ANON. [Editor].

634.61-2.19

The premature fall of coconuts.*Trop. Agriculturist*, 1941, 96 : 253-4.

The cause of premature nutfall of coconuts is still unknown but data obtained indicate that it may be due to physiological factors produced by inadequate soil moisture and possibly to a fungus disease active in the wet weather. [In the Solomon Islands Lever (1935) and Phillips (1940) find that the *Amblypelta cocophaga* bug is responsible, see *H.A.*, 5 : 487 and 11 : 593.—Ed.] The symptoms suggest *Phytophthora palmivora*, though the fungus could not be isolated in the laboratory. This editorial is published in the hope of stimulating interest which might result in helpful suggestions from the public on a problem that is probably more agricultural than scientific.

1430. FROGGATT, J. L., AND O'CONNOR, B. A.

634.61-2.7

Insects associated with the coconut palm. Part II.**N. Guinea agric. Gaz.*, 1941, 7 : 125-33, bibl. 6.

The pests dealt with in this part are the beetles *Promecotheca papuana* Csiki, *Brontispa froggatti* Sharp and certain other *Hispidae*. For the control of *Promecotheca* some success has been achieved by the introduction of the parasitic wasp *Pleurotropis parvulus* from Java. Mechanical control methods consist, with young palms, in hand collection of eggs and adults and in crushing the larvae inside the mines in the leaves. On larger palms they may be scorched without injury to the foliage by applying flares made of coconut husk soaked in oil to the undersurface of the fronds. Some success was achieved by the use of lead arsenate sprays. *Brontispa*, which attacks the spear, can usually be easily killed by pouring a solution of Black-leaf 40 (nicotine sulphate) down the opening central shoot. The possibilities of biological control are given attention.

1431. PENDERS, J. M. A.

633.61-1.8

Asch van klapperbolster als grondstof voor de winning van kalimeststof.

(Coconut husk ash as a fertilizer.) [English summary 15 l.]

Landbouw, 1941, 17 : 179-90, bibl. 17, and *Economisch Weekblad*, March 1941.

Ash obtained from coconut husk will probably contain about 30% K₂O. There should be sufficient available in the Dutch East Indies to supply local needs for potash manure for several years. Its manurial value on the basis of its chemical composition is discussed. Some precautions should be taken in using the ash for such crops as tea or tobacco.

1432. ANON.

634.651

Papaya (*Carica papaya*).*Malay. agric. J.*, 1941, 29 : 194-9, bibl. 2, being *Agric. Leaflet. Dep. Agric.**S.S. F.M.S. 22.*

The leaflet which is here reproduced deals with the cultivation of the papaya for fruit production in Malaya and seems to have included all of practical value that there is to be said on the subject.

1433. RAM, A.

634.662

Ber (*Ziziphus jujuba*) crop, 1940.*Punjab Fruit J.*, 1941, 5 : 898-9.

Information is given on recent varietal trials at Lyallpur of *Ziziphus jujuba*. The best of the varieties tested are well suited for boundary planting and should form a profitable sideline for smallholders and others.

* Part I, *Ibidem*, 1940, 6 : 16-32, *H.A.*, 10 : 236.

1434. WARDLAW, C. W. 634.771

The banana in Central America.

Trop. Agriculture, Trin., 1941, 18 : 157-63, bibl. 6.

Part I. Cultivation. This section, included in this article, has already been abstracted (*Nature*, 1941, 147 : 313-6 ; *H.A.*, 11 : 598). Part II. The control of *Cercospora* leaf spot. The devastation caused by the establishment of *Cercospora musae* in the banana plantations is graphically described. The disease could only be controlled by spraying the plants every 2 to 5 weeks. To effect this in the large areas affected spraying installation had to be erected on a huge scale, the equipment including power-houses, large-scale mixing tanks, pumping units and an ample pipe-line system throughout the plantations. The author considers this effort and the success it attained as one of the greatest achievements in the history of phytopathology. The plantations are now in full and profitable production. A description of the plant and the methods of operation follows. Some practical aspects of the control of leaf disease are discussed. Part III. Panama disease. This disease, *Fusarium oxysporum cubense*, presents many curious and unexplained aspects which are discussed, and having so far proved incurable, may be considered a more serious problem than *Cercospora*. Collective experience, practical and scientific, indicates that hydrogen-ion concentration in the soil is the master factor determining the severity of Panama disease, followed by texture, but distribution of the pathogen and density of its population in the soil require careful consideration. An interesting and promising experiment is in progress at present. This consists in flood-fallowing an area of about 100 acres which had previously been put out of production by the disease. The four sections into which the area is divided will each be submerged for a different length of time, the maximum period being 18 months. The experiment is based on the facts that the fungus requires oxygen to live and that highly infected soil submerged for one month under 2 feet of water has been cleared of the disease. Indications from other sources are not wanting that on frequently inundated land the disease is almost negligible.

1435. EASTWOOD, H. W. 634.771

Maintenance of fertility of banana land.

Agric. Gaz. N.S.W., 1941, 52 : 148-51.

The retention of trash and stems on a banana plantation is essential for its continued fertility. The value lies largely in the mulching and erosion prevention properties of the material and in the organic matter that it provides. The best way to utilize the stems, cut up if necessary, is to bury them in trenches between the rows, or they can be left lying scattered or in windrows and covered with soil. The growing practice of selling the stems to be manufactured into wool, fibre or board is not to be encouraged. The resulting loss to the soil and the cost of additional artificial fertilizers would not be compensated by the price received.

1436. OFFICERS OF THE FRUIT BRANCH, QD. 634.771

The banana.

Qd agric. J., 1941, 55 : 472-83.

Approved methods of banana cultivation in Queensland.

1437. BIOLOGICAL BRANCH, N.S.W. 634.771-2.4

Squitter and black-end diseases of banana.

Agric. Gaz. N.S.W., 1941, 52 : 316-7.

Control of squitter (*Nigrospora sphaerica*) and black-end (various fungi including *N. sphaerica*, *Gloeosporium musarum* and *Fusarium* spp.) can be obtained by dipping the cased fruits (packed as single fruits in Australia) in a fungicidal solution after packing, preferably a salicylanilide or its compounds. Those marketed under the trade name of Shirilan are suitable. Suggestions are made for the best and most economical method of carrying out the operation.

1438. COOMBES, A. N. 634.774

Culture de l'ananas : l'espacement des plantes. (Pineapple spacing in Mauritius.)

Rev. agric. Maurice, 1941, 20 : 86-91.

The main pineapple varieties grown in Mauritius are Queen and Bourgault for local consumption, fresh, and Cayenne Lisse for preserving. The trials in three places here noted concerned the

last named variety. They indicate that pineapples could profitably be planted more closely than has previously been the custom. According to local conditions of soil, etc., they should be spaced in rows 18 to 20 inches apart and with a gap of 16 to 20 inches between plants.

1439. HANCOCK, W. G.

634.774

Pineapples in the Queensland tropics.

Qd agric. J., 1941, 55 : 374-81.

Some principles of pineapple culture in the warmer parts of Queensland are discussed. Emphasis is laid on the need for close planting to ensure that the ground is shaded and the root conditions as cool as possible. An east-west alignment also assists in this. Under cooler conditions in south Queensland a north-south planting is advised to enable as much light as possible to reach the plants. In north Queensland medium sized suckers form the best planting material. Stripping off a few basal leaves will help rooting. There is usually scope for selection of suckers, from early or late maturing plants and from those which sucker freely. Those which produce a collar of slips round the fruit are not desirable in north Queensland since the slips used for propagation are less heat-resistant than suckers. Only light cultivation should be given; it is particularly important not to damage the roots while the plant is maturing fruit. The benefit to cultural and harvesting operations of having a batch of plants maturing in succession is pointed out. It can easily be achieved by care, one precaution being to grade the suckers for size and to plant the different sizes in separate blocks. In manuring the plants the best method is still that of placing the fertilizer exactly in the lowest leaf bases, where it slowly dissolves. One handful to 4 plants equals 40-50 lb. per thousand. Three such applications during the season are needed. A first application soon after planting is important. The number of fruitlets is irrevocably determined by the nutrition of the plant up to the forming of the embryo inflorescence. Subsequent nutrition can only increase their size. Acetylene gas will force young plants into flower. By skilful manipulation of time of planting, acetylene and fertilizer the crop can be harvested at a predetermined time. The acetylene solution can be prepared by placing a lump of carbide as large as a hen's egg in a kerosene tin of water. After effervescence has subsided it is ready. The dose is 2 oz. poured into the heart of each plant. Flowering will then occur in from 4 to 7 weeks according to variety, and harvesting in a further 16-17 weeks. Development of the fruitlets is a more reliable guide to maturity than colour.

1440. MCKNIGHT, T.

634.774-2.4

Water blister disease of pineapples.

Qd agric. J., 1941, 55 : 180-2.

In the hope of reducing the considerable losses from water blister of pineapples occurring in consignments in Queensland its causes and control are briefly summarized. Factors governing the incidence of water blister are (1) the presence of pineapple refuse in and around the packing shed; (2) fruit bruised and wounded before or after packing; the various kinds of injury are discussed; (3) delay in marketing; (4) wet weather which stimulates the causal fungus; wet weather following a dry period causes growth cracks on the fruit; (5) temperature and humidity during transport. Preventive measures of careful handling and hygiene will suggest themselves. Complete disinfection of the packing shed and of second-hand cases with 2-5% solution of formalin may be necessary; the fruit should never be bagged when picked; packing if possible should be done on the headlands; discarded fruits should be burned before they rot with *Thelaviopsis* or yeasts. In weather favourable to an outbreak the stem-ends of the fruit before packing may be dusted with benzoic acid 1 part, kaolin 4 parts. Experiments did not support the contention that small hard fruit was less susceptible than fruit receiving relatively heavy nitrogen manuring. The reverse was, in fact, the case.

1441. PADILLA, J. E.

634.774

Apuntes sobre el cultivo de la pina en Costa Rica. (Pineapple growing in Costa Rica.)

Rev. Dep. nac. Agric. Costa Rica, 1941, 6 : 129-32.

1442. BELLO, A. C. 635.25 : 631.8
A study of fertilizers with onions grown on Lipa clay loam in pots.
Philipp. Agric., 1941, 29 : 772-90, bibl. 9.

With onions grown in pots in Lipa clay loam in the Philippines the addition of a nitrogenous fertilizer consisting of a mixture of sulphate of ammonia and nitrate of soda was very successful not only as regards size of crop but also shape of onion. Nitrate of soda alone was not so good as sulphate of ammonia alone and neither was so good as the mixture. The best results came from the pots which received in addition to the above the mixture 0.1 gm. ZnSO_4 per plant, the second best from one receiving 0.29 gm. CuSO_4 , and well behind were results from pots which also received 0.3 gm. MnSO_4 or 0.3 gm. $\text{Na}_2\text{B}_4\text{O}_7$.

1443. LAZO, F. D., AND ILAGAN, J. M. 635.34 : 551.566.1
Further variety test of cabbage.
Philipp. j. Agric., 1941, 12 : 43-60, bibl. 4.

This, like the previous article by Rodrigo, P. A., *Ibidem*, 9 : 1-30, describes tests of cabbage varieties at Los Baños Economic Garden, Laguna, and at the Central Experiment Station, Manila.

1444. HUTCHINGS, C. D. 635.655
The soybean.
J. Jamaica agric. Soc., 1941, 45 : 222-3, 225-6.

An account is given of the methods of cultivating the soybean with special reference to Jamaica, where attempts to introduce it as a regular crop are in progress.

1445. PADWICK, G. W. 635.8
Mushroom cultivation in India.
Indian Fmg., 1941, 2 : 363-6, bibl. 8.

A brief account of the technique of mushroom cultivation, with special reference to Indian conditions.

STORAGE.

1446. HYNES, H. J. 664.85+664.84
Spoilage of fruit and vegetables.
Fruit Cult., N.S.W., 1941, 11 : 130 : 4.

In an interview in lieu of a paper which he was to have read, Dr. Hynes attributed much of the spoilage of fruit and vegetables to faulty handling and packing by which the fruit became bruised and rendered susceptible to attack by moulds. Examples in the case of grapes were careless use of the scissors, packing the fruit when warm without sweating, the use of insufficient granulated cork. The sterilization of cases, while useful, does not affect those spores which are already present on the fruit, and cleanliness in the orchard and packing shed is perhaps more important. Inadequate ventilation of the fruit in transit is a frequent source of spoilage.

1447. BHAT, S. S., AND DHARESHWAR, S. R. 631.56 : 634.872+634.651+634.323
A study of the factors influencing the grading of grape, papaya and grapefruit.
Trop. Agriculturist, 1941, 96 : 129-41, bibl. 6.

Large numbers of grapes, papaya and grapefruit have been examined in an attempt to find standards by which they may be satisfactorily graded for market. *Grapes*. Bunch and berry have to be considered, the bunch counting more than the berry. Given ripeness, grading factors would be size, compactness and weight of bunch. With the Bhokari grapes from the Ganeshkhind Fruit Experiment Station, India, a common commercial variety in Western India, compactness was fairly uniform and size of bunches varied proportionately with their weight. Weight therefore was taken as a practical measure for field work. The following grades are suggested. *Special*. Bunches weighing 12 oz. and over ; *First*, 4-12 oz. ; *Second*, below 4 oz. Blemishes without reduction of a value allowed up to 5% of the berries. *Papaya*. The fruit was taken from a plantation of Washington growing at the Modibag Garden, Poona. Very large and very small fruits are usually difficult to sell. Weight, length and maximum circumference were studied in 786 fruits, these characters being found to be positively correlated

between any two. The following grades based on individual weight are suggested. *Special*, 80 oz. and over; *First*, 60-80 oz.; *Commercial I*, 40-60 oz.; *Commercial II*, 20-40 oz. Grade value may be lowered by excess of blemishes and by over-ripeness. The fruit at sale should be just soft enough to ensure ripeness but hard enough to stand peeling and cutting. *Grapefruit*. Length, maximum circumference and weight were studied in 990 Marsh grapefruits from Modibag and Ganeshkhind and were found to be positively correlated between any two of them. Grapefruit are sold by number and therefore size is the factor which counts and this depends mainly on circumference. Large fruits, however, are often thick-skinned and fluffy. The grades proposed are—*First*, circumference 12-14 in., passing through 4.5 in. hole and not 4 in. *Second*, 14-16 in., passing through 5.0 in. hole and not through 4.5 in. Larger fruits are placed second as being more juicy and therefore more economic than the small Grade 3. *Third*, circumference 10-12 in., passing through 4.0 in. hole and not through 3.5 in. The field grading may be done with plywood pieces having holes of the different sizes. Blemished but consumable fruit should be graded for size and discounted in value.

1448. TILLER, L. W.

664.85.11

Orchard storage of apples.

Orchard. N.Z., 1941, 14: 68-9, 71.

A report on some salient points arising from the orchard storage experiments recently undertaken in New Zealand. Four types of store of a kind which could be constructed by growers without difficulty were used. The apple varieties used were Sturmer, Granny Smith, Statesman, Washington, Ballarat, Rome Beauty, Rokewood, Tasma, Dougherty. The principal points emerging from the investigations are set out for each variety.

1449. WHITTAKER, E. C.

634.11:664.85.11

Crispness in apples.

Agric. Gaz. N.S.W., 1941, 52: 425-6.

Lack of crispness in apples is attributed to storing too long (a) in orchard sheds, (b) in cool stores. Delicious should not be in orchard storage for more than one week and should be put in cool storage immediately after picking. Granny Smith has a better keeping quality in common or orchard storage. A result of this is that growers hold it far too long in common storage before sending it to cool storage so that it often reaches the market in a mealy and unpalatable state.

1450. ANON.

664.85.11.038

Ditton apple dip.

Gdnrs' Chron., 1941, 110: 113.

A simple treatment for improving the keeping qualities of apples of certain varieties in ordinary storage has been evolved by the Department of Scientific and Industrial Research. It will be marketed under the name "Ditton Apple Dip" after the laboratory at which the experiments were made. The treatment consists in dipping the fruit in a liquid that leaves a harmless and almost invisible film on the skin. Dessert apples tried have not responded satisfactorily. Two varieties found to respond satisfactorily to the dip, namely, Bramley's Seedling and Newton Wonder, will keep from 4 to 6 weeks longer than normal. Wilting and bitter pit were reduced and in most of the trials rotting and scald also. Treated apples will be useful in commercial growing for filling the gap between the finish of the apples in unrefrigerated storage and the opening of the gas stores.

1451. TRESSLER, D. K., AND MOYER, J. C.

664.85.13:577.16

Changes in vitamin C content of Bartlett pears in cold and gas storage.

Food Res., 1941, 6: 373-6, bibl. 7.

During ordinary cold storage of pears at -1.1°C . a loss of about one-third of the vitamin C content occurred in the first month. Thus the vitamin C content of freshly picked pears on a fresh weight basis was .090 mg./gm., after a month .064 mg./gm., after two months .049 mg./gm., and after three months .047 mg./gm. Pears stored in tin cans pierced with single, $\frac{5}{16}$ " holes lost appreciably less vitamin C than those not so enclosed.

1452. WILLISON, R. S. 634.25-1.547.6+664.85.25.037

Studies in maturity and cold storage of peaches.

Sci. Agric., 1941, 21 : 624-45, bibl. 28.

The paper deals with criteria for judging maturity and stages of ripeness at which peaches should be picked to withstand various shipping conditions and with the effects on peaches of the temperatures most commonly encountered during transportation by train or ship.

1453. WOODROOF, J. G. 664.84.037+664.85.037

Foods suitable for freezing preservation [and] freezing locker plants.

Bull. Ga Exp. Stat. 212, 1941, pp. 34, bibl. 13.

This most instructive bulletin deals at considerable length with fruit and vegetables suitable for frozen pack methods. Characteristics of fruit making for good frozen pack storage are stability of colour and of flavour on exposure to air, sufficient acidity, sweetness. Generally speaking pears and grapes are not very suitable. Results with other fruits are given as excellent for blueberry, cherry, fig, raspberry, strawberry; very good for dewberry; good for apple, blackberry, persimmon; and fair for peach, plum and muscadine grape. Vegetables are similarly grouped. The preparation of fruit and vegetables for frozen pack treatment is considered. Fruit and vegetable juices vary in their suitability for freezing. Thus raspberry and strawberry juices are classified as excellent, dewberry, grape and tomato juice as very good, apple juice as fair. Building requirements of a successful freezing locker room and the layout of such a room are considered. Finally the best methods of serving frozen pack products are described.

1454. WOODROOF, J. G. 664.8.037

The desiccation of frozen foods in freezer locker stores.

Fruit Prod. J., 1941, 20 : 306-9, 321, bibl. 4.

The desiccation of foods held in a frozen stage in freezer locker stores, i.e. lockers rented by the private individual for cold storing domestic produce, is a serious problem. It arises from many causes, such as using the storage room for freezing purposes, too frequent opening of the locker doors, poor packing, the use of small containers and the absence of close stacking, but problems of building construction, plant management and food processing are also involved. In this article these factors are thoroughly investigated.

1455. HEID, J. L. 664.85.3.037+663.813 : 634.3

The freezing preservation of citrus fruits and juices.

Fruit Prod. J., 1941, 20 : 375-7, 384, 389, bibl. 10.

The article discusses briefly the most suitable citrus varieties for frozen juice or frozen sections, the harvesting and preparation of the fruit, equipment, sanitation of factory plant, extraction of juice, screening, sweetening and blending, deaeration, filling, containers, freezing and storing.

1456. BIALE, J. B., AND SHEPHERD, A. D. 664.85.334

Respiration of citrus fruits in relation to metabolism of fungi. I. Effect of emanations of *Penicillium digitatum*, Sacc., on lemons.

Amer. J. Bot., 1941, 28 : 263-70, bibl. 30.

The apparatus for subjecting citrus fruit to emanations of fungi is described and the variability of results is discussed. The emanations of a single lemon attacked by *Penicillium digitatum* can cause a very marked increase in the rate of carbon dioxide evolution and accelerate colour development of sound, green lemons in as many as 500 fruits. Temperatures of 14°, 20° and 25° C. were equally favourable to the production of active vapour by the fungus but it was inhibited at 2.5° C. Active emanations were also produced by *P. digitatum* when grown on agar. The nature of the emanations has not been determined by chemical means but the very pronounced increase in the rate of respiration and the acceleration of chlorophyll destruction suggest the presence of ethylene.

1457. LEONARD, E. R., AND WARDLAW, C. W. 664.85.771

Studies in tropical fruits. XII. The respiration of bananas during storage at 53° F. and ripening at controlled temperatures.

Ann. Bot., Lond., 1941, 5 : 379-423, bibl. 19.

The respiration of individual banana fruits of standard commercial grades during storage at 53° F. and ripening at controlled temperatures of 65° F. and 68° F. were investigated by methods

yielding data on respiration rates, on internal concentrations of CO₂ and O₂ and on the CO₂ content of the tissues. The results are discussed in relation to the findings of other investigators for other fruits, e.g. apples and pears. Consideration is also given to the significance of the readjustments of the internal concentrations of CO₂ and O₂ which take place on transferring fruit from tropical temperatures to 53° F. and their relation to the development of abnormal ripening trends, e.g. in chilled fruit. Other relevant topics are also discussed. [From authors' summary.]

1458. KHAN, A. H.

664.85.3.037

The cold storage of citrus fruits.

Punjab Fruit J., 1941, 5 : 900-2.

Some results obtained at Lyallpur in the experimental cold storage of citrus are noted. The most suitable temperature was 36-39° F. Valencia Late exhibited the best keeping qualities and remained in good condition for 4½ months, common Malta for 4 months and Seville and Blood Red for 3 months. Mandarins from the markets at Lyallpur kept for 5 weeks and from Panthankote for 4 weeks. In 1938 hand-picked, carefully handled mandarins from Lyallpur Experiment Station kept for 7 weeks. At the same temperatures Triumph grapefruit kept for 5 months and Marsh Seedless for 3¼ months. There was some skin blemish from chilling which affected the price adversely but not the flavour. Grapefruit wrapped in greaseproof paper had a more attractive appearance and a higher juice content, particularly the larger and medium-sized fruits, which should, therefore, be packed separately. Investigations are proceeding on the effects of locality and type of package on storage life.

1459. HITZ, C. W., AND HAUT, I. C.

664.85.11.038

Effect of certain waxing treatments at time of harvest upon the subsequent storage quality of Grimes Golden and Golden Delicious apples.

Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 440-8, bibl. 7.

Further studies relating to the effects of certain waxing treatments on the subsequent storage quality of Grimes and Golden Delicious apples.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 249-56, bibl. 3.

Early picking of Grimes Golden leads to excessive wilting in cold storage. In their preliminary report of waxing experiments the authors showed that waxing materially reduced the percentage of wilt and loss in apples given any pre-ripening treatment. Waxing the fruits after 1 week of pre-ripening resulted in decreased wastage over fruits put in cold store immediately after picking. Pre-ripening Grimes for 1 week at 57-60° F. before waxing averted the development of undesirable flavours hitherto reported to accompany waxing. In continued experiments in 1938 and 1939 waxing Grimes Golden apples with Byrtene wax 489A or 489AR significantly reduced loss in weight. The wax remained effective when the samples were held 3 weeks at 60° F. following 21 weeks in cold store. The number of wilted fruit in the Grimes Golden and Golden Delicious at the end of the storage periods was much less in the waxed fruits.

1460. CLAYPOOL, L. C., AND KING, J. R.

664.85.11.038

Fruit waxing in relation to character of cover.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, 38 : 261-5.

In all tests the type of wax seemed to be more important than the thickness of film. Emulsions high in carnauba wax gave consistently poorer control of water loss for the same film thickness than did waxes high in paraffin even though the carnauba waxes seemed to have better wetting ability. The character of the fruit surface is important in relation to kind and concentration of wax used. Thus water loss in apricot, because of the thick mat of hairs over its surface, can be reduced more with a particular emulsion than water loss in such fruits as nectarine, pear and tomato. The large lenticels increase the difficulty of waxing the Winter Nelis pear and the nectarine as also do the corky russet areas of the Winter Nelis pear. Effectively to reduce water loss on these fruits waxes must be able to penetrate and plug or partially plug the openings in these areas. The tomato is the easiest to wax but owing to its smooth surface concentrations of wax emulsions may have to be increased in order to increase the wax film thickness to get the desired control of water loss. The solvent waxes are of doubtful value for pubescent fruits

or those with many lenticels on the fruit surface but give satisfactory results on the smooth surface of the tomato.

1461. SCHAPPELLE, N. A. 664.774.038

A physiological study on the effects of waxing pineapples of different stages of maturity.

Res. Bull. Rio Piedras P.R. agric. Exp. Stat. **31**, 1941, pp. 32, bibl. 24.

Red Spanish pineapples, in which the weight losses were no greater than those produced by a 4% paraffin emulsion, coloured almost fully. When concentrations of 6% or higher were used the colour changes in shipping-green fruit gradually decreased to nil. Weight losses were reduced 35 to 45% by waxing with 4% paraffin emulsion. This was better than bee wax or colloy. Waxes of paraffin emulsions up to 6% concentration were progressively more effective in reducing weight loss. Further reduction in weight loss continued up to 12% emulsions, but not above this. Waxing the leaves was much less effective in reducing weight losses than waxing the fruit. The waxing of shipping-greens and partly ripened fruits with 4% emulsions tended to cause further decreases in sugar concentrations beyond those which normally occur in fruit stored without waxing at those stages of ripeness. The waxing of plant-ripened fruit did not cause decreases in sugar concentrations but both waxed and unwaxed fruit showed increased sugar concentration during storage. The waxing with 4% emulsion tended to decrease the acid concentration at all stages of ripeness. The shipping-greens lost appreciably more acids during storage than the partly ripened fruit. The physiological reactions giving rise to these data are discussed.

1462. ANON. 664.84.21

La conservation des pommes de terre de table et de semence dans les caves et dans des silos. (Storing potatoes in cellars and clamps.)

Publication de l'Office de Propagande pour les Produits de l'Agriculture suisse, Zurich, Sihlstrasse 43, 1940, pp. 16.

Among points made are the following :—1. In *cellar storage* there must be absolute cleanliness of air, walls and floor of cellar, the walls being treated with milk of lime containing 2% copper sulphate. Cellar temperature should neither fall below 35·6° F. or rise above 46·4° F. Air humidity should be maintained at 80-90%. Potatoes must be sorted and those diseased or damaged in any way removed. Heaps should not exceed 1·5 m. in height or 2·0 m. across. Danger occurs when the temperature rises to 48°-50° F. within the heap. At this point the heap must be remade. Seed potatoes should be kept separately in open-sided wooden fruit boxes. Cement floors are suitable, provided they are absolutely dry. If not, a layer of cinders or dry furnace dust should be used. Similarly, if the walls are moist, wooden slats should be interposed between the potatoes and the wall. In big heaps aeration can be helped by the insertion at intervals of about 2 m. of empty fruit boxes. The potatoes can be left in sacks only for very short storage. 2. *Clamp storage*. Details are given for proper aeration and protection from cold.

PROCESSING AND PLANT PRODUCTS.

1463. AMERINE, M. A., AND WINKLER, A. J. 663.25

Color in California wines. IV. The production of pink wines.

Food Res., 1941, **6**: 1-14, bibl. 11.

Some of the common red grape varieties grown in California appear to be well adapted to the production of early pressed pink wines. Such wines are shown to have less extract, tannin and colour than the wines fermented on the skins. A brief, interesting account is given of the different sources of European pink wines.

1464. AMERINE, M. A., AND WINKLER, A. J. 634.8:581.192:663.2

Maturity studies with California grapes. I. The Balling-acid ratio of wine grapes.

Proc. Amer. Soc. hort. Sci. for 1940, 1941, **38**: 379-87, bibl. 11.

It has been found possible by utilizing the varietal differences in the Balling-acid ratio at different degrees of Balling to segregate (*vinifera*) grapes into groups based on their best adaptation for given types of wine under a given environmental condition. Although the adaptability can be predicted, the quality of the wine cannot.

1465. TRESSLER, D. K., CELMER, R. F., AND BEAVENS, E. A. 663.3

Bulk fermentation process for sparkling cider.

Industr. Engng Chem. (Industrial Edition), 1941, 33 : 1027-31, bibl. 11.

The author describes a rapid method of producing sparkling cider by the secondary fermentation of cider in closed, glass-lined pressure tanks. The method involved the secondary fermentation of cider in tanks to which had been added pasteurized, frozen or concentrated apple juice plus various sweetening agents, a little ammonium monohydrogen phosphate and an actively fermenting starter which had previously been inoculated with a good champagne yeast. When the fermentation had developed 90 lb. per square inch CO₂ pressure the product was cooled by circulating cold water in the jacket. The cool cider was pumped through a roughing filter into a refrigerated, glass-lined tank. It was then chilled to about -3.3° C., pumped through a Seitz sterilizing filter into a semi-automatic isobarometric bottling machine, filled in bottles and closed with crowns. Details are given of each part of the procedure. The entire process from cider to sparkling cider takes about 5 days.

1466. HILTON, R. J. 663.813

Fruit juice processing.

Chem. Industr., 1941, 60 : 688-90, bibl. 1.

A brief outline of the more modern methods used in Eastern Canada for apple juice manufacture. Golden Russet by itself produces the best apple juice of any variety pressed by the author. The processes are crushing and grinding; pressing; clarifying either by the gelatin-tannin method or by treatment of juice by the pectin reducing enzymes "Pectinol" or "Filtragol"; filtering, the medium being asbestos, cotton pulp, diatomaceous earth or prepared sheets of asbestos and paper; sterilization by flash pasteurization; filling and labelling; carbonation if desired. There is also still a limited demand for unpasteurized juice to which chemical preservative, e.g. one-tenth of 1% sodium benzoate, has been added. The author also mentions the processing of rhubarb, grape, blackcurrant, raspberry, and strawberry juices. He gives average data from 9 English, American and German sources of apple juice analysis and finally quotes the conclusions of Fawns and Martin on the chemical composition of apple juice [*Ibidem*, 57 : 60-5; *H.A.*, 8 : 901].

1467. LAL, G. 663.813 : 634.11

Preparation and preservation of unfermented apple juice.

Punjab Fruit J., 1941, 5 : 952-4.

A method of bottling apple juice, suitable for small estates in the Punjab. The apples used were Yellow Newtown Pippin and Baldwin. The article is based on investigations carried out at the Fruit Products Laboratory, Lyallpur.

1468. HALLOWELL, E. M. 663.813 : 634.11 + 634.8

A new method of processing grape and apple juices.

Fruit Prod. J., 1941, 20 : 368-9, 387, reprinted from *The Glass Lining*, summer issue, 1941.

The method consists in storing the freshly pressed juice under high CO₂ pressure prior to bottling. Refrigeration or pasteurization before bottling are eliminated. The method is economical as 65% of the gas can be recovered and used again, sterilization of the pressure tanks is unnecessary and the juice so treated is superior in flavour and brightness.

1469. CRUESS, W. V., AND OTHERS. 663.813 : 634.22

Prune juice experiments.

Fruit Prod. J., 1941, 20 : 196-8, 214, 233-4, 251, 253.

Prune juice (extract of dried prunes) made by extraction with water at 175-180° F. was superior in quality to that extracted at 212° F. Plain tin cans were less efficient than re-enamelled cans and cans treated with the so-called apple juice enamel in the retention of aroma and flavour. The diffusion method of preparation described gave superior results to the vacuum concentration method. Dehydrated prunes were superior to sun-dried.

1470. ADAM, W. B., AND GILLESPIE, T. G. 634.22-2.19 : 546.27

Fruit gumming of Victoria plums. Progress report III.*

A.R. Fruit Veg. Pres. Res. Stat. Campden for 1940, 1941, pp. 43-7, bibl. 4.

Treatment of Victoria plum trees with boric acid, by branch injection and by spraying, caused a significant fall in the percentage of plums containing gum. [Authors' summary.]

1471. ATKINSON, F. E., AND STRACHAN, C. C. 664.85.23.047

Candying of fruit in British Columbia with special reference to cherries.

Fruit Prod. J., 1941, 20 : 132-5, 166-9, 185, 199-201, 217, 219, 229-32, 262-64,

289, 291, 310-2, 323, 324, bibl. 15, being *Contr. hort. Div. Summerland exp. Stat., B.C.*, 573.

This publication deals with the candying of fruit either for the bakery trade or for sale as a confection. Commercial procedures are given and a summary of experiments is included which may be of value to other investigators. The general subject of pretreatment is dealt with in a separate section, while modifications in leaching, dyeing, syruping and draining are given with each fruit discussed. Products included are red and green candied cherries, maraschino cherries from light and dark sulphured stock, apricots, peaches, pears, apple pieces, citron melon, and zucca melon. Improved types of syruping and concentrating equipment are illustrated and described. Chemicals, equipment and procedures necessary for a control laboratory to ensure standardization of the products are listed and explained. Experiments covering leaching of sulphured stock, inversion of sucrose, effects of pH on pigments in cherries, and rates of evaporation in candied fruit dehydrators are included. [Authors' abstract.]

1472. THOMAS, P. H.* 664.85.11.047

Peeling apples for drying and canning.

Tasm. J. Agric., 1941, 12 : 108-9.

The paper reports the results of investigations at a local canning factory to ascertain for apples (a) the net weight of fruit recovered after peeling and coring from varieties of differing size and shape range, (b) the time occupied in peeling and coring such varieties and sizes. The results show the economic advantage of operating with the larger sized fruit both in time saved and in higher percentage in weight of fruit recovered. The minimum size of fruit at present accepted is $2\frac{1}{4}$ in. In Sturmer for instance a bushel of $2\frac{1}{4}$ in. passed through the peeling and coring machine in 5 min. 15 sec. with a weight loss of 51.5% ; $2\frac{3}{8}$ in. Sturmers took 2 min. 51½ sec. and lost only 38.6%. The number of fruits were 205 and 115 respectively.

1473. BURRETT, A. 664.85.047

Dried fruit packing and processing.

J. Dep. Agric. S. Aust., 1941, 44 : 508-9.

The paper is written by a grower and contains much practical advice on packing and processing dried apricots and peaches so as to obtain the maximum value. Small fruit is uneconomical from the start and the reasons for this are traced.

1474. WIEGAND, E. H. 634.13-1.57 + 664.85.13.036.5

Pear handling and canning.

Canad. Food Packer, 1941, 12 : 4 : 15-7.

Summary of an address by Professor Wiegand, Oregon Experiment Station, at the 6th annual convention of the Canned Foods Association of British Columbia. Advice on many practical points in connexion with canning factory methods is given.

1475. ADAM, W. B. 664.85.036.5 + 664.84.036.5

Control of sweetness in canned fruits and vegetables.

A.R. Fruit Veg. Pres. Res. Stat. Campden for 1940, 1941, pp. 15-32, bibl. 14.

A survey of the problems of maintaining the sweetness of canned fruits and vegetables has been undertaken, and a series of tasting tests have given a general indication of the efficacy of the various methods studied. The survey covered the undermentioned ground. The use of glucose syrups, of saccharin, of dulcin, the reduction of total acidity by the addition of alkali or the increase of pH by means of alkaline buffers, alteration of ratio of fruit to sugar.

* For I and II, see *H.A.*, 8 : 1316 and 10 : 1528.

1476. HORNER, G. 635.64 : 631.56

The estimation of total solids in tomato products.

A.R. Fruit Veg. Pres. Res. Stat. Campden for 1940, 1941, pp. 33-8, bibl. 10.

A survey of the methods which have been used by various workers for the estimation of solids in tomato products was carried out with a view to recommending a method suitable for routine examination of samples and capable of giving results which could be reproduced in different laboratories. A procedure is finally recommended.

1477. HORNER, G. 635.64 : 631.56 : 581.192

The copper content of tomato products.

A.R. Fruit Veg. Pres. Res. Stat. Campden for 1940, 1941, pp. 39-42, bibl. 6.

The amount of copper present in tomatoes has been shown to depend to some extent on the copper contamination of the soil and on the use of copper fungicides in field cultivation. It is suggested that a limit of less than 50 p.p.m. of copper calculated on the dry solids would be impracticable in the case of canned tomato products. [Author's summary.]

1478. GILLESPIE, T. G. 664.85.036.5 : 632.4

Studies on the mould, *Byssoschlamys fulva* (III).*

A.R. Fruit Veg. Pres. Res. Stat. Campden for 1940, 1941, pp. 54-61, bibl. 1.

The presence of small concentrations of sulphur-dioxide in suspending media at pH values below 3.7 has been shown to enhance the lethal effect of heat on the ascospores of *Byssoschlamys fulva*. [Author's summary.]

1479. MRÁK, E. M. 664.85.047

Some factors in the production of dried fruits.

Fruit Prod. J., 1941, 20 : 267-76, 293, bibl. 7.

An outline is given of the procedures followed and types of deterioration encountered during the sun drying of fruits in California.

1480. ANON. 664.85.047 + 664.84.047

Le séchage des fruits et des légumes et l'emploi des produits séchés. (Drying fruits and vegetables and the use of the dried products.)

Publication de l'Office fédérale de Guerre pour l'Alimentation, Berne, Switzerland, 1940, pp. 16.

A small brochure for domestic use giving methods of small scale drying of apples, pears, cherries, plums and other stone fruit, beans, spinach, peas, potatoes, herbs and mushrooms, their conservation and use.

1481. SPRENGER (A. M.). 664.85.11.047

Die Trocknung von Äpfeln. (Apple drying investigations in Holland.)

Note in *Schweiz. Z. Obst-u. Weinb.*, 1941, 50 : 81-2.

Peeling was done by hand. Attempts were made to get rid of the brown discoloration which is very often caused on peeling by oxydases and remains after drying. Fruits treated with sulphur successfully retained their white colour even after drying. Immersion in a 2% salt solution prior to drying had the same result. Apples dipped in a 20% hot sugar solution showed a rather darker colour but were appreciably lighter than untreated fruit. Keeping the dried apples in a place where the light reached them resulted in their becoming darker both in the case of treated and untreated fruit. It was not possible to establish optimum drying temperatures for individual varieties. The method of cutting determines the length of time needed for drying, thus cutting into rings is cheaper than quartering. Peeling accelerates the drying process. The moisture content of dried apples on the market was usually 24% whereas after drying they only contain 8-9%. This means that they are liable to absorb atmospheric moisture again after drying. The net weight after drying varies considerably according to variety, the greatest waste occurring in the peel removed, especially in the case of small apples. The average loss due to peel removal in the Wageningen trials was 24%, and the average net weight of dried apple with a moisture of 20% was 12.9%.

* For I and II, see *Ibidem* for 1936/37, pp. 68-75, and *Ibidem* for 1938, pp. 60-7, *H.A.*, 8 : 1318 and 9 : 1509.

1482. LAL SINGH AND LAL, G. 664.84.047

Drying of vegetables.

Indian Fmg., 1941, 2: 308-16, bibl. 5.

An account is given of the general principles of drying vegetables, a detailed account of drying potatoes and brief outlines of the methods of drying onions, cauliflower, carrots and peas together with some experimental results obtained in investigations under the Fruit and Vegetable Preservation Scheme of the Punjab Government and Imperial Council of Agricultural Research. In this article the effect on the vitamin content of the processes recommended is not discussed.

1483. BECKLEY, V. A., AND NOTLEY, V. E. 664.84.047

Drying of vegetables.

E. Afr. agric. J., 1941, 7: 3-7.

An account is given of the solution of the problem of the manufacture and supply of palatable and vitamin-containing dried vegetables to troops in East Africa. The vegetables proving most satisfactory were potatoes (blanched, i.e. the enzymes killed by heat), cabbage (unblanched), cauliflower (blanched), carrots (unblanched), French beans (unblanched). In the case of the unblanched vegetables it has been found that blanching spoils the appearance and palatability of the product and destroys much of the ascorbic acid content. Dried sweet pepper has been found to contain more ascorbic acid than any other natural product and is equivalent to some of the best concentrates; accordingly it has been decided to add 5% of sweet pepper to the mixed vegetable ration for native troops. At the moment 30 tons of dried vegetables per week are being produced and a factory to deal with still larger quantities is being erected in the Kikuyu Native Reserve. The various troubles that may occur, resulting in great loss of vitamin content, render processing unsuitable for the individual farmer while the prices paid for the vegetables do not attract the European but are very acceptable to Africans, hence the selection of the factory site. Intensive investigations are continuing.

1484. LAL SINGH AND LAL, G. 634.3: 668.526.4

Production of citrus oil as a home industry.

Punjab Fruit J., 1940, 4: 804-7.

A method, suitable for home manipulation, of extracting oil from citrus peel is discussed.

1485. BALLS, A. K., AND ARANA, F. E. 633.821-1.56

The curing of vanilla [*Vanilla fragrans*].

Industr. Engng Chem. (Industrial Edition), 1941, 33: 1073-5, bibl. 10.

The very old established methods of processing vanilla beans to produce the required aroma are here described. They are found to cause a marked increase in CO₂ evolution from the tissues, whereas freezing produces a contrary effect. Oxidization during the curing process does not necessarily lead to carbon dioxide, however, and may be carried on by enzymes of the peroxidase type. Vanilla beans contain much peroxidase and a complex peroxidase system persists even after the curing is complete. It is suggested that vanillin may be an intermediate product in the development of the desired aroma and that oxidization products of vanillin may contribute thereto.

1486. LAVA, V. G., TORRES, P. E., AND SANVICTORES, S. 634.61-1.56

Chemical studies on coconut products. III. A new process for the extraction of coconut oil.

Philipp. J. Sci., 1941, 74: 247-83, bibl. 5.

The expeller process for coconut oil extraction is uneconomical. If the degree of extraction of oil emulsion from fresh coconut meat could be made high and the separation of the oil from the emulsion made efficient, oil extraction directly from fresh meat should be the more economical method. Preliminary laboratory experiments show that in conjunction with the Lava process for coconut-oil extraction directly from fresh meat the roller method of obtaining the oil emulsion from the coconut meat is better than the cage hydraulic press method, but that improvements in the system of feeding fresh meat and in roller design are necessary before the process can be commercially practicable. Calculations show that an oil recovery efficiency of from 76 to 81% or at the outside of 92% would allow the new process to compete with the expeller process. [From authors' summary.]

1487. BLACKIE, W. J. 658.8 : 634.61

Copra quality and grading methods in Fiji.

Agric. J. Fiji, 1941, 12 : 68-75, bibl. 3.

The article is written to show how the copra produced in Fiji can be prepared and graded so as to compete with that from other countries.

1488. IPPISCH, F., Jr. 633.88+633.825

La preparación de algunas plantas medicinales y sus productos para la exportación. (**Preparation of some medicinal plants and their products.**)

Rev. agric. Guatemala, 1941, 18 : 53-8.

Instructions for the preparation of medicinal plant products by the grower in Guatemala. The products dealt with are bitter aloes (*Aloe* spp.), balsam of Peru (*Myroxylon sonsonatensis*) and ginger. The series is continuing.

1489. MACKINNEY, G. 581.175.11

The coloring matters of plants. I. Chlorophyll. II. Carotenoids.

Fruit Prod. J., 1941, 20 : 313-4; 344-5, 356.

A semi-technical account of plant pigments with special reference to the food industry.

1490. JUKES, E. M. T. 577.16

The vitamins.

J. Inst. Brew., 1941, 47 : 237-50.

The paper provides a brief but scientific survey of the methods used and knowledge acquired to date in vitamin research.

1491. ZIMMERMAN, W. I., TRESSLER, D. K., AND MAYNARD, L. A. 635.1/7 : 577.16

Determination of carotene in fresh and frozen vegetables by an improved method. II. Carotene content of asparagus and green lima beans.

Food Res., 1941, 6 : 57-68, bibl. 8.

The new method presented here is based partly on the use of diacetone for extraction of total pigments and the use of a solution of diacetone for extraction of chlorophyll and xanthophyll from their solution in petroleum ether. The method is thought to have certain advantages over alcoholic saponification procedures.

1492. PETERSON, W. J. 577.16

Recent developments in methods for determining carotene.

Industr. Engng Chem. (Analytical Edition), 1941, 13 : 212-6, bibl. 38.

Improvements in methods for the extraction and quantitative determination of β -carotene in dry and fresh plant tissue are described.

1493. KIRK, M. M., AND TRESSLER, D. K. 577.16 : 634.1/8+635.1/7

Ascorbic acid content of pigmented fruits, vegetables and their juices.

Food Res., 1941, 6 : 395-411, bibl. 38.

The titrimeter method for determining ascorbic acid was applied to pigmented fruits and fruit juices to determine the effect of variety and treatment on the ascorbic acid content. As determined by this method, fruits were found to have a daily variation in ascorbic acid content. This is probably caused by differences in the part of the season, ripeness, amount of sun, and quantity of rain. There was a pronounced varietal difference in the fruits, and different portions of an individual fruit were found to have great differences in ascorbic acid content. Peach skins contain two to four times as much ascorbic acid per gram as the pulp. Eggplants have a higher ascorbic acid content in the skin with little difference between the portion immediately under the skin and the centre portion. The ascorbic acid content of strawberries is .40 to 1.04 mg. per gram; raspberries .13 to .30; blueberries .13 to .20; plums .03 to .10; peaches .07 to .13; turnips .32 to .47; blackberries, cherries and dewberries, very little vitamin C. Eggplants show small losses of ascorbic acid in storage, with temperature, on the whole, playing a minor role. In manufacturing fruit juices, much vitamin C is lost in preparing the fruit for juicing. The loss of ascorbic acid is immediately inhibited by heating. The temperature of

pressing has little effect on ascorbic acid retention if the fruit is heated between 60 and 76·7° C. (140 and 170° F.), although the pressing process causes some loss. In the experimental work reported here the ascorbic acid content is inversely proportional to the amount of sugar added, even when compared on a sugar-free basis. This may be caused by oxidization by air incorporated while stirring in the sugar. Storage in glass bottles in a dark room causes no appreciable change. Biological assay indicated that the electrometric titrimeter method of ascorbic acid determination was valid for strawberry juice and that regeneration with hydrogen sulphide was unnecessary. In apple juice prepared from the Greening variety and that from a mixture of Greening and Cortland varieties, there was less vitamin C than in the pomace after pressing out the juice. This was not true for Baldwin apples. Apple juice as commonly prepared is very low in ascorbic acid. [From authors' summary.]

1494. FELLERS, C. R., AND BUCK, R. E. 664.84 : 577.16
Retention of vitamins C and A in glass-packed foods.
Food Res., 1941, 6 : 135-41, bibl. 19.

Experiments at Amherst, Mass., showed that strained peas, spinach and tomato juice packed in glass containers and stored for a year at room temperatures lost only 10-25% of their vitamin C content, most of the loss occurring in the first two or three months in store. Flavour was better after storage at 36° F. than at room temperature. Glass-packed spinach, carrots, peas and tomato juice retained 85% of their vitamin A content after storage in subdued light for a year.

1495. GOLDBERG, L., AND LEVY, L. 634.421 : 577.16
Vitamin C content of fresh, canned and dried guavas.
Nature, 1941, 148 : 286, bibl. 3.

The common guava, *Psidium guajava*, is shown to be a potent source of ascorbic acid that deserves fuller recognition. Ascorbic acid content in guavas from various parts of South Africa averaged in mgm. per 100 gm. for green and hard fruit 250-350, ripe and firm fruit 300-450, overripe and soft fruit 50-100. The proportion of ascorbic acid in skin, outer pulp and inner pulp may be 12 : 5 : 1. The stone contains none. Selected fruit so used may contain as little as 18 mgm. per 100 gm. Slow drying at a low temperature is the most successful procedure for preservation of the vitamin.

1496. BROWN, A. P., AND MOSER, F. 635.64 : 577.16
Vitamin C content of tomatoes.
Food Res., 1941, 6 : 45-55, bibl. 28.

Stone tomatoes from 5 different sources in Utah showed on immediate filtration at the laboratory 26·2±·39 mgm. vitamin C per 100 mgm. There were inconclusive indications that vitamin C content rose as the season advanced and that there is an inverse relationship between vitamin C content and size of fruit. No loss of vitamin C occurred in fruit held for 18 days in cold store at 44° F. or in the laboratory. Tomatoes grown on poles showed a significantly greater vitamin C content than unsupported tomatoes and tomatoes grown in the greenhouse showed a mean vitamin C value of approximately one-half that of those grown in the open.

1497. OLLIVER, M. 635.1/7 : 613.2
The effect of cooking on the nutritive value of vegetables.
Chem. Industr., 1941, 60 : 586-95, bibl. 11.

Boiling, steaming, baking and frying have been taken as typical methods of cooking and their effects on the nutritional content of various vegetables have been considered. The paper contains much of interest and value.

1498. KELLY, E., AND PORTER, T. 635.65 : 577.16
Effect of cooking upon the vitamin B₁ content of two types of beans grown in Michigan.
Food Res., 1941, 6 : 85-93, bibl. 8.

After being boiled or baked by standard methods yielding tender products two types of bean (*Phaseolus vulgaris*), Michelite and Cranberry, were found to have more available vitamin B₁ than the same beans raw, examined by the rat-growth method.

1499. MAPSON, L. W., AND BARKER, J. 634.1/7 : 613.2

The use of alkalies to save sugar in cooking acid fruits.

Chem. Industr., 1941, 60 : 661-3, bibl. 3.

Twenty to forty per cent. of the sugar required to make acid fruit palatable was saved by adding a small quantity of sodium bicarbonate either before, but preferably after, cooking. The losses of ascorbic acid were small. For most fruits and rhubarb the amount recommended is 0.3 to 0.4 gm. per 100 gm. of raw fruit (half a level teaspoonful to 1 lb.) but with gooseberries and blackberries up to 0.6 to 0.9 may be added. Excess will reduce the acidity too much and have a deleterious effect on flavour, ascorbic acid content and colour.

1500. COWIE, G. A. 633.491 : 641.5

Blackening of potato tubers on boiling.

Nature, 1941, 148 : 285-6, bibl. 2.

Referring to a recent article by Miss U. M. Robison (*Nature*, 1941, 147 : 777-8 ; *H.A.*, 11 : 1005) in which the hypothesis is advanced that the blackening of potato tubers on boiling is produced by oxidation from ferrous iron liberated from a loose complex, probably in association with proteins, as a result of hydrolysis on boiling, it is mentioned that the discoloration in recent experiments at Rothamsted was confined to tubers grown on potash-deficient soils in association with a relatively high nitrogen level. Various workers have shown that potash-deficient plants do accumulate iron. It would have been interesting to know whether Miss Robison found significant differences in the potassium content and potassium-iron ratio between normal tubers and those that went black on boiling.

1501. ROBERTS, E. A. H. 633.72-1.56

Post-mortem darkening of plant tissues and its relation to respiration.

Nature, 1941, 148 : 285, bibl. 3.

The subject of the title is discussed with special reference to tea.

1502. PYKE, M. 635.1/7 : 613.2

Green vegetables as protein foods.

Food Manuf., 1941, 16 : 156, 160.

An attempt to show that it should not be beyond the powers of scientific workers to perfect an economically practical method of extracting protein, not only from vegetables normally eaten, but from herbage in general.

1503. ANON. 634.11 : 613.2

Apple seed oil and muscle weakness.

Canad. Food Packer, 1941, 12 : 2 : 15.

A suggestion in this article that apple seed oil might prove to be an excellent source of vitamin E is disposed of by the Editor who, on the authority of the Summerland Experimental Station, states that it requires a ton of apples to produce one pound of apple seeds and that a special process would be required to remove them from the waste at dehydration, canneries, juice plants, etc. Since the vitamin is widely distributed in common foods this would seem to be an unprofitable method of obtaining it.

1504. ARNOLD, P. T. D., BECKER, R. B., AND NEAL, W. M. 634.323-1.57

The feeding value and nutritive properties of citrus by-products. II. Dried grapefruit pulp for milk production.

Bull. Fla agric. Exp. Stat. 354, 1941, pp. 14; bibl. 12.

Trials show that dried grapefruit pulp is a desirable bulky carbohydrate concentrate for use in rations for dairy cattle. Trials over 3 years showed it to be of much the same value as dried beet pulp. Neither of these rations given in the dry form imparts any undesirable flavour to the milk, but several dairymen have stated that if dried grapefruit pulp is soaked it imparts a noticeable flavour when fed in quite large amounts shortly before milking.

1505. ANON. **Soy bean plastic.** 635.655 : 631.56
Science, 1941, Vol. 93, No. 2411, *Suppl.* pp. 8-9.
 Soya bean "wool" or fibre is about to be used for motor-car seats and for clothing. Moreover the Ford laboratories are working to develop panels made of plant fibre, held together with a soya bean resin binder, which will resist blows as well as or better than steel. Fibres of ramie are being added to increase tensile strength. The fibre panel which is intensely strong and only half the weight of a steel panel is composed of 70% fibre and 30% resin binder. The fibrous element is made of 50% southern slash pine fibre, 30% field cereal straw, 10% cotton and 10% hemp. The first Ford car of which the entire superstructure, except the tubular, welded steel frame, will be made from this tough fibre plastic will appear this coming winter.
1506. DE SOUZA, L. J. 664.8.036.5
The development of the canning industry in India.
Indian Fmg., 1941, 2 : 225-7.
 CLARK, B. S. 663.813
Technology of canned juices.
Fruit Prod. J., 1941, 20 : 265-6.
 BALLENTINE, R. 663.813 : 577.16
Determination of ascorbic acid in citrus fruit juice.
Industr. Engng Chem. (Analytical Edition), 1941, 13 : 89, bibl. 5.
 LORENZ, A. J., AND ARNOLD, L. J. 634.334 : 581.192 : 577.16
Preparation and estimation of crude-citrin solutions (vitamin P) from lemons.
Food Res., 1941, 6 : 151-6, bibl. 28.
 CRUESS, W. V., AND PONTING, J. 634.22-1.57
New and improved prune products in relation to the prune surplus.
Fruit Prod. J., 1941, 20 : 340, 355, 357.
 ATKINSON, F. E., AND SAMPSON, D. F. 664.84.65.036.5
Firming effect of calcium chloride on canned tomatoes.
Canad. Food Packer, 1941, 12 : 3 : 11-2.
 SMITH, M. C., AND OTIS, L. 577.16
Observations on carotene analysis of vegetables and fruits, as a basis for prediction of their vitamin A value.
Food Res., 1941, 6 : 143-50, bibl. 6.
 SHAPTER, R. E. 633.85
A preliminary investigation of the yield and composition of the oil distilled from *Chenopodium ambrosioides* (Linn.) var. *anthelminticum* (Gray).
J. Coun. sci. industr. Res. Aust., 1941, 14 : 201-8, bibl. 9.
 WENDLAND, R. T., FULMER, E. I., AND UNDERKOFER, L. A. 635.24 : 631.56
Butyl-acetonic fermentation of Jerusalem artichokes.
Industr. Engng Chem. (Industrial Edition), 1941, 33 : 1078-81, bibl. 19.
 TORRES, J. P., AND CRUZ, P. I. 633.522-1.56
A preliminary report on the effect of delayed shipping and drying of abacá fiber.
Philipp. J. Agric., 1941, 12 : 1-14.
 TORRES, J. P., AND CRUZ, P. I. 633.522-1.56
Efficiency of different Benito knives for stripping Abacá.
Philipp. J. Agric., 1941, 12 : 15-30, bibl. 1.
 BENTON, S. F. 633.72-1.56
Some points on [tea] manufacture.
Memor. Indian Tea Ass. Tocklai exp. Stat. 13, 1940, pp. 24.
 INTENGAN, C. LL., AND WEST, A. P. 668.64
Preparation and analysis of run Manila copal.
Philipp. J. Sci., 1941, 74 : 83-93, bibl. 4.
 Resin from *Agathis alba*.

NOTES ON BOOKS AND REPORTS.

1507. GOURLEY, J. H., AND HOWLETT, F. S. 634.1/8
Modern fruit production.
 Macmillan, New York, Rural Textbook Series, 1941, pp. 579, bibls. numerous,
 18s.

Pomology has indeed, as the authors remark, developed into a science in its own right, and each branch of it demands its own treatise. Still, their omission of the two very large branches which deal with pests and diseases has enabled them to compress within reasonable compass a well-documented and admirably up-to-date account of other phases of deciduous fruit growing. It is based indeed on Gourley's *Textbook of Pomology* published in 1922, but the reader need have no fear whatever of resurrection pie with garnishings. This is an entirely new book dealing with modern horticultural conditions and research. Since it is primarily written for the U.S.A. most of the sources of information are American and varieties recommended are those suitable for American conditions. Despite this there is no lack of recent European findings, especially those of English workers. It is a book demanding a certain elementary knowledge and understanding in the reader. It will not help the amateur gardener to plant his couple of gooseberry bushes and one dwarf apple tree, but it certainly should be a very competent guide to the research worker, lecturer and large-scale fruitgrower in all deciduous fruitgrowing countries as to proper action in face of a very large number of ordinary fruitgrowing problems and on the fundamental principles on which such action should be based. Among subjects discussed the following are perhaps of particular interest:—*The fruit plant and its parts. Factors affecting flower formation. Fruit setting.* Consideration is given to questions of pollination and to ecological factors. Mention is not made of spraying to prevent premature fall. *Sites and soils.* This more particularly concerns the American worker. *Laying out and planting. Cultural practices.* This includes a discussion of the merits of the rival systems of mulching and other cultural treatments and of different cover crops. *Fertilizers and manures,* including notes on fertilizers for different fruits, effect of light on colour of fruit, effect of manuring on keeping quality. *Water relations* and their effect on quality. Much modern work is considered in this section. *Pruning. Thinning and alternate bearing.* The effect of thinning on different fruits is discussed. *Winter injury.* This contains much on the possibility of checking winter injury by cultural methods such as use of hardy stocks, windbreaks, etc., but very little on practical methods of dealing with injury suffered. *Nutrient deficiencies.* The deficiencies considered are those of nitrogen, phosphorus, potassium, magnesium, calcium, boron and zinc. Various storage disorders such as Jonathan spot, fruit cracking in cherries, etc., are discussed. *Propagation and stocks.* This chapter is particularly informative and full use is made of recent work on rootstocks. *Storage.* This includes notes of the latest work on spray residue removal, fruit packing, gas storage, etc. As regards gas storage it is interesting to note that the cost in the U.S. is likely to be considerably above that in the U.K. owing to the necessity for greater insulation against extreme cold in the U.S. *Origin and improvement of fruits* by breeding and selection. It is a very simple matter with any and every new textbook to point to omissions and we could wish that the authors, albeit guardedly, had drawn the reader's attention to recent work on the treatment of cuttings, grafts and seeds with growth substances, on the diagnosis and cure of nutritional deficiencies by spectrographic and injection methods, on Russian grafting work using "mentors". But orthodoxy is more prudent than rash prophecy and perhaps with new work appearing on such subjects monthly the authors are wise to leave their discussion to the lecturer until such time as the frills of to-day become the unexciting petticoats of to-morrow. Of new research on orthodox lines they certainly give us ample measure and their book should be in the library of all horticultural institutes.

1508. LAWRENCE, W. J. C., AND NEWELL, J. 631.531+631.532/5
Seed and potting composts.

George Allen & Unwin, London, revised 2nd edit., 1941, pp. 136, 3s. 6d.

That the horticultural world would quickly appreciate the value of discoveries concerning potting and seed-raising composts and partial soil sterilization made by the authors at the John

Innes Horticultural Institution seemed inevitable when this book was first published in 1939 (reviewed *H.A.*, 9:1086) and so it has proved. A second edition has been called for and opportunity has been taken to make certain amendments and revisions arising from work carried on in the interval and from growers' reports. For those who are unacquainted with the first edition it may be briefly stated that the theme of the book is that one specific compost will give optimum results with nearly all potted and boxed plants while the same compost with some slight modifications (not always necessary) will raise most seeds. Considerable attention is also paid to partial soil sterilization with the proviso, which will doubtless greatly relieve the ill-equipped amateur gardener, that, while a necessity in exact scientific work and of much virtue in commercial growing, it is not essential to the use of the composts. Information acquired since the issue of the first edition is presented in a new chapter, No. 8, entitled "The John Innes Composts". It is recognized that the small amount of compost, in a pot will not support a plant indefinitely. To meet this contingency a liquid feed (L) and a dry feed (D) have been evolved. One or other of these applied as instructed will supply all deficiencies. (These feeds as well as the composts can be obtained ready mixed from firms whose advertisements appear on the end pages and from others.) Some useful quantitative tables are given in conclusion which will be invaluable to those preparing their own compost. Gardeners who have acquired the first edition will get the second. The canny who refrained have probably grown a lot more bad plants meanwhile. They can feel definitely assured that poignant, in these days, as are the pangs of parting even with 3s. 6d., the contents of the book will provide an ample and profitable solace.

1509. SCHWEIZERISCHE GEMÜSE-UNION. 635.1/7 : 631.564+664.84
Wegleitung für die Gemüseabsatz und die Aufbewahrung der Dauergemüse.
 (Guide to the preparation of vegetables for market and their storage.)
 Zug, Switzerland, 1940, pp. 80.

This well-illustrated and eminently practical little book first shows the best methods of packing the different Swiss vegetables for market and how they should be graded, and in the second part indicates the best methods of storing those vegetables, which can be kept until such time as they are wanted in cellars, specially built ventilated stores, small earth-protected huts and clamps and beds. Finally as regards storage the following points are stressed:—(1) Harvesting should preferably be done in dry weather. (2) Storage rooms should be disinfected with chloride of lime (Weisselkalk) or sulphur. (3) When preparing beds or clamps see that there is proper drainage. (4) Store dry vegetables only. (5) Remove all damaged plants or parts of plants. (6) Keep storage room under continual inspection. (7) Ventilation is essential and should be regulated according to the thermometer. Optima are storage temperature of 2.4° C. and atmospheric humidity of 65-75%.

1510. IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS. [Compiler, AKENHEAD, D.] 019 : 633/635
Index to Horticultural Abstracts, Volumes I-X, 1931-1940.
 I.B.H.P.C., East Malling, 1941, pp. 160, 25s.

A comprehensive subject and author index of the first ten volumes of *Horticultural Abstracts*. Used in conjunction with the abstracts it affords an annotated bibliography of recent horticultural research.

1511. ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS. 54 : 63
Proceedings of 56th Annual Convention at Washington 1940.
J. Ass. off. agric. Chem. Wash., 1941, 24 : 205-512, 517-798.

The Proceedings take the form of a number of reports by Associate Referees. Among those of possible interest to our readers are the reports on Fertilizers (various), Preparation of fertilizer samples for analysis, Fruits and fruit products, Fruit acids, Tomato products, Iodine, boron and zinc in plants, Chlorophyll and carotene in plant tissue. These reports cover 2 of the 3 days of the meeting. [There is no indication whether others are to follow.]

1512. CAWTHRON.

63(072)

Annual Report of the Cawthron Institute for 1940, 1941, Nelson, N.Z., pp. 38.

Brief notes are given of research in different branches of agriculture. They include a number of items on fruit research. *Magnesium deficiency in apples.* As a result of injection experiments very good correlation has been obtained between the magnesium status of the leaves and the severity of deficiency symptoms shown by the trees. An enhanced effect on the trees over the previous season of the original magnesium top dressing was observed. Additional applications last spring have not so far resulted in corresponding benefit. The rapid penetration of magnesium into the soil is noted. Spray treatment of magnesium-deficient trees may be a useful temporary measure till the soil top dressings of magnesium compounds become fully operative. *Boron.* Soil top dressings of borax, $\frac{1}{2}$ and 1 lb. per tree, increased internal breakdown in stored Jonathans but less so than last year. Lord Wolseley was unaffected. Brown spotting of apricots and pitting of cherries was controlled by borax top dressings. *Long-term manurial experiments.* The rapid deterioration of trees receiving N and P without K is now becoming marked. *Storage.* The cessation of fruit exports to Great Britain has resulted in the initiation of a comprehensive series of orchard storage investigations. *Tomatoes.* Early steam sterilization of the soil greatly reduced "cloud" in glasshouse tomatoes for reasons as yet unknown.

1513. CEYLON, TEA RESEARCH INSTITUTE.

633.72

Annual Report of the Tea Research Institute for 1940, 1941, being Bull. 22, pp. 86.

Mycology. Work on the investigation of phloem necrosis is reported. *Agricultural chemistry.* Investigations are discussed on the decomposition for humus of vegetable materials containing tannin, on foliar diagnosis for nutrient deficiencies, on the time of application of manures and on the nitrogen economy of tea. *Plant physiology.* Research was centred round selection and vegetative propagation of selected material. Single node cuttings were more successful than those bearing two or three nodes. The use of the proprietary growth substance Hortomone A encouraged much more rapid root formation and allowing the cuttings to callus in a rooting medium of $\frac{1}{2}$ peat $\frac{1}{2}$ sand for a month before treatment with the growth substance proved advantageous. Time of immersion, i.e. 16 or 32 hours, made little difference. The reasons for callusing without rooting and for prolonged bud dormancy of some cuttings in the rooting medium are being sought. Reports of other departments are also included.

1514. GOLD COAST.

633.74

Report on the Department of Agriculture, Gold Coast, for the year 1940-41, 1941, pp. 10, 1s.

The cacao research station and laboratories at Tafo are providing an excellent centre for cacao research and striking progress has been made particularly in the investigation of swollen shoot disease. It is hoped to keep Tafo comparatively free from this disease so that it may not affect other aspects of cacao research there. The search for the insect vector of swollen shoot has resulted in the recording of two cases of transmission by the cacao psyllid *Mesohomotoma tessmanni*. The method of selection of cacao is not to fix a standard which all trees must pass but to select the highest yielding trees on each plot or farm chosen for detailed observation. Three hundred and twenty-eight selections have been made for resistance to swollen shoot. At Tafo tree recordings show that the number of pods produced per tree and per plot and the average girth per tree were all lower under vertical shade, that fewer shaded trees died than unshaded and that there appeared no best planting distance even in one locality or on one soil type. The native method of random close planting, allowing the trees to thin themselves as they mature, is probably the best practice.

1515. IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, INDIA.

633/635

Scientific reports of the Imperial Agricultural Research Institute, New Delhi, for the year ending 30th June, 1940, Delhi, pp. 126, 4s.

A series of brief reports on the work accomplished by the Institute during the year under review. The reports of the specialist officers concerned with economic botany, mycology and entomology and sugar cane are included.

1516. MADRAS PRESIDENCY.

634.3-1.541.11

Report on the Operations of the Department of Agriculture, Madras Presidency, for the year 1939-40, 1941, pp. 81, 8 annas.

The report contains some experimental results of horticultural interest, including notes on the work of the Kodur fruit research station on citrus rootstocks and mango. This has already been discussed elsewhere and abstracted *H.A.*, 11 : 1033, 1034.

1517. MAURITIUS.

633.61

Eleventh Annual Report of the Sugarcane Research Station, Mauritius, 1940, 1941, pp. 31.

In the research section reports are made on the following. Experiments on the induction of polyploidy by the use of colchicine. Some abnormalities were produced in the treated seedling cane. A full description of the experiments is to be published. Foliar diagnosis as a practical method of determining nutritional deficiencies formed the principal chemical research. In botanical research a progress report is made on the time of application of fertilizers; no benefit was obtained from burying trash as a fertilizer during 3 successive years; a ridge *versus* furrow planting experiment in a wet district resulted in a significant increase in yield of 3.1 tons per arpent in favour of ridge planting; time of planting trials with reference to borer attack showed little difference between July and October planting. Other projects are also mentioned.

1518. NEW ZEALAND D.S.I.R.

633/634

Fifteenth Annual Report of the Department of Scientific and Industrial Research N.Z. 1940-1941, 1941, pp. 92, 1s. 9d.

Fruit research, pp. 42-5. NPK experiments continue with Cox's Orange, Dunn's Favourite, Delicious, Jonathan and Sturmer apples. Long-term experiments on Jonathans at Upper Moutere continue to show the necessity for complete fertilizer, all treatments from which N, P or K has been omitted giving inferior results. A rapid decline has followed the omission of potash. Malling stocks XII and XVI continue to maintain their lead in growth over Northern Spy. Delicious and Cox are being classified into colour strains. In both varieties with one or two exceptions the highly coloured "sports" are inferior in flavour and quality to the parent. Similar work is now being done on Jonathan, Northern Spy and Sturmer. Mycologists report work on apple bud rot (*Fusarium lateritium*), *Phoma* spot, mouldy core, eye rot and scab. Magnesium deficiency work continues. Soil applications of magnesium carbonate at 2 lb. per tree and magnesium sulphate at 7 lb. per tree have given marked response. Spraying 1% Epsom salts + spreader three times and seven times resulted respectively in considerable improvement and almost a return to normal four and a half months later. Improvements in spray programmes are discussed. Borax has continued to control brown spotting in apricots and probably pitting in cherries. *Capitophorus potentillae*, but not *Tetranychus telarius*, is found to be a vector of yellow edge and of crinkle in strawberry. Raspberries and peach trees have been inoculated with crown gall (*Phytoplasma tumefaciens*) but without detrimental results. Work continues on raspberry mosaic, rootrot and bud moth. Citrus work is of a preparatory nature. *Fruit cold storage research*, pp. 46-8. Laboratory experiments for 2 years with Jonathan apples suggest that Jonathans can be successfully gas-stored until early October at 42° F. in an atmosphere containing 8% CO₂ and 13% O₂. The work is now being taken to the semi-commercial stage. Similar trials with Sturmer indicate that 40° F. and 42° F. in 8% or 10% CO₂ with 13% or 11% O₂ are equally satisfactory. Manurial treatment appears not to affect the storage quality of Delicious. Different effects with other varieties are recorded. Effects of boron on storage quality of Sturmer, Jonathan and Lord Wolseley are briefly considered. Superficial scald which developed in first picked Granny Smith apples was completely controlled by the use of oiled wraps. Work shows that for satisfactory storage Jonathan should be picked at an early stage of maturity and stored at a temperature not below 38° F. Orchard storage trials suggest the importance of maintaining as low a temperature as possible. A fairly high atmospheric humidity appears to be desirable but neither cases nor fruit should be actually wet. Points affecting storage of different varieties are noted.

Tobacco research, pp. 48-51. Work continues at Umukuri and at Cawthron.

Botany Division, Wellington, pp. 14-16. Successful trials are recorded of the chemical content of the following medicinal plants grown in New Zealand :—*Digitalis purpurea*, *Atropa belladonna*, *Datura stramonium*, *Hyoscyamus niger*, *Ricinus communis*. Trials of *Phormium* are being made on the Moutoa Estate.

1519. NYASALAND.

633.85

***Annual Report of the Department of Agriculture, Nyasaland, 1940, 1941*, pp. 24, 2s. 6d.**

The report, while mainly dealing with routine work, contains some notes of interest on tung. At the research station at Zomba, there is a high percentage (40%) of predominantly male trees in the plantation of *Aleurites montana*, a not unusual phenomenon in other countries when unselected seed is used; the yield of the predominantly female trees is also variable. In *A. fordii* neither of these factors operates to the same extent. Budding or grafting on the lateral branches of male *montana* when 3 or more years old with scions from high yielding female trees resulted in the production of healthy shoots which produced only female flowers and fruited in less than a year after budding. This method may provide a means of rapidly converting unprofitable trees into good yielders.

1520. PUERTO RICO.

633.73 + 634.774

***Annual Report of the Agricultural Experiment Station, Puerto, Rico, 1939-40*, pp. 66.**

The following notes are taken from the summary of progress of research. *Coffee*, pp. 33-41. Applications of nitrogen and phosphoric acid to coffee over seven years in various quantities per acre showed increasing yields with increasing amounts. A result considered to be of value was the failure of potash applications over 112.5 lb. per acre to increase yield. Phosphorus was shown to be indispensable in the manuring of coffee. Some useful notes are contributed on the different characteristics of shade trees for coffee, *Gliricidia sepium* being very favourably mentioned. The undermentioned conditions proved the most successful in the rooting of coffee cuttings. Growth substances + talc, naphthyl acetamide (1-250), indoleacetamide (1-1,000), Hormodin Nos. 1 and 2; as rooting media, pulverized wood and roots of giant fern [presumably mixed.—Ed.]; bottom heat 95° F.; external temperature maintained at 85° F. under shade. In these conditions half-ripened wood of dark brown colour was best; green wood, leafy cuttings all failed to root. In shade experiments $\frac{1}{2}$ – $\frac{1}{4}$ solar radiation intensities produced equally good effects on growth and yield; full and $\frac{3}{4}$ intensities were detrimental. Root studies on clay showed that 94% of the roots of 21-year-old coffee were in the upper 12 inches of soil and that lateral and vertical extension was over 4 feet from the trunk and not below 8 feet from the surface respectively. The pathogenicity of the fungus *Rosellinia bunodes*, generally considered responsible for the black or root rot of coffee, could not be established, but a *Fusarium* sp. was isolated of which the filtrate (bacterial filter) produced a severe wilt accompanied by the characteristic vein-banding, mosaic-like yellow pattern and final yellowing and browning of the leaves. The *Fusarium* was able to grow under a very wide range of pH. *Pineapple*, pp. 55-9. The best pH for root development seemed to be 6. Waxing the fruit greatly reduced loss of weight and prevented cracking, wrinkling and subsequent fungus infection. Iron chlorosis was brought about by excessive manganese in the soil. Root rot in water cultures was controlled by the addition of copper 2 parts per million. There are brief notes on the local diseases of a number of other fruits.

1521. QUEENSLAND ACCLIMATISATION SOCIETY.

634/635

***Seventy-fifth Report of the Queensland Acclimatisation Society, April, 1940-March, 1941*, 1941, Brisbane, pp. 12.**

The report includes notes on preliminary trials with seed of the following medicinal plants :—*Cinchona succirubra*, *Cinchona hybrid* and *C. ledgeriana*, *Strychnos nux-vomica*, *Strophanthus kombe*, *S. emini*, *Ephedra gerardiana*.

1522. TANGANYIKA TERRITORY.

633.73

Seventh Annual Report Coffee Research and Experiment Station, Lyamungu, Moshi, for 1940, 1941, pp. 17, 1s. 6d.

With all except the two senior members of the European staff on active service, research has had to be somewhat curtailed. The report contains a review of cultural and manurial co-operative experiments on estates and native holdings. General inferences from these experiments are that sulphate of ammonia at the rate of $\frac{1}{2}$ lb. per tree when used alone gave useful increases of yield. In a year of short rains mulching gave appreciable returns in two out of three cases. Thatching grass used as mulch gave an annual mean increase of nearly 20% over no treatment plots. Guinea grass gave a substantial though lower increase. The records contain much other information which cannot be analysed at present through shortage of staff. Experiments on the station showed holing three months previous to planting and planting with a ball of earth at nursery level to be superior to all other methods tried. In anti-erosion experiments weeds laid on the contour proved very effective and did not damage the coffee. Banana mulch is adequate as an anti-erosion measure and conserves moisture in the dry season. Striking visual evidence was obtained of the value of reducing a crop when it is clear that the trees are going to overbear.

1523. TUCUMAN (CROSS, W. E.).

63

Actividades de la sección fomento agrícola durante el segundo semestre de 1940. (Work of the agricultural section of the Tucuman Experiment Station for the 2nd half of 1940.)*Publ. Estac. exp. agric. Tucuman 16, 1940, pp. 25, bibl. 1.*

A few notes of a very general character are given on the work of the experiment station. The remainder of the paper deals with the Cotton and Citrus Exhibition and reports certain speeches made there. These, though dealing with agriculture and citriculture, are also of a general nature.

1524. UNITED PROVINCES, INDIA.

634.11

Annual Administration Report of the Department of Agriculture, United Provinces, for the year ending 30th June, 1939, 1940, pp. 87.

The following notes from the Chaubattia Fruit Research Station are the chief items of horticultural interest in this report (p. 57). Size and colour of apples were increased by thinning, without reduction of yield. Ringing unfruitful trees in April induced flowering. Budding apples on Crab C stock in September or grafting in March with grafting wax gave better results than budding in May or grafting in March with clay. Rootgrowth hormones proved useful in increasing rooting of apple stock cuttings. Oxalis was controlled by 1% spray of sodium chlorate three times a year and Siroo grass by one $2\frac{1}{2}$ % spray of the same chemical.

1525. VINELAND.

634/5

Report of the Horticultural Experiment Station, Vineland, for the year ending March 31, 1941, 1941, pp. 7.

Apple orchard cultivation. Five years' records are now available. On the minimum cultivation plots, i.e. plots which are sufficiently worked in the spring to give a good seedbed and are then sown down to a green manure crop, the nitrate nitrogen level was low throughout the season. On the regular cultivation plots the nitrate level was higher for the 6-8 week period from mid-June to mid-August. The higher nitrate level delayed fruit maturity, reduced fruit colour and caused greater loss in drop in McIntosh. A system of green manuring which will keep the nitrate level low but still leave enough for the trees to make normal growth appears to be the ideal. There were no appreciable differences in soil moisture. Other projects include:—*Peach picking times.* *Cherry rootstocks*, using new varieties and as rootstocks mazzard and mahaleb as well as a vegetatively propagated mazzard selection F 12/1 from East Malling. *Peach fertilizers.* *Fruit by-products.* A new laboratory to study canning of fruit juices and pulp and the therapeutant qualities of juices should now be complete. *Fruit breeding.* Search is being made for varieties suitable for quick freeze preservation. *Vegetable breeding.* Work is in progress on sweet corn, melons, rhubarb and many other vegetables. *Variety testing.* The aim is to determine for Ontario the value of the constant flow of new varieties of fruit and vegetables.

1526.

The annual reports listed below have also been examined :—

A.R. Dep. Agric. Basutoland for Rep. year ended 30 Sept. 1940, pp. 13.

Rep. Agric. Dep. Bihar for 1937-38, pp. 71+3, 10 annas [received Oct. 1941].

Administ. Rep. Dir. Agric. British Guiana for 1940, 1941, pp. 20.

A.R. Dir. Agric. Cyprus for 1940, 1941, pp. 4, 3 piastres.

A.R. Dep. Agric. The Gambia for 1940-41, 1941, pp. 8.

14th A.R. agric. Res. Inst. Northern Ireland, Hillsborough, 1940-41, 1941, pp. 22.

A.R. Dep. Agric. New Guinea for 1939-40, *N. Guinea agric. Gaz.*, 1941, 7 : 77-122.

Rep. Dep. Agric. St. Lucia for 1940, 1941, pp. 12, 6d.

A.R. agric. Dep. St. Vincent for 1940, 1941, pp. 10.

NOTE TO SUBSCRIBERS

REVISION OF PRICE OF VOLS. I AND II AND OF SINGLE NUMBERS

As from January 1st, 1942, the price of each current or back volume will be 25/-* and of each single number, 7/6.

* Concession price 20/- to subscribers, other than trade, in the British Commonwealth sending their orders direct.